PUBLIC WORKS

Sept. 1958

CITY, COUNTY AND STATE

Modern Methods of
REFUSE DISPOSAL
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City-Industry Join in
WATER SUPPLY
Project
page 100

REPAIR PROGRAM
for Sidewalks
page 106

Putting Personality Into
TRAFFIC SIGNALS
page 129

Check List for
SEWAGE PLANT DESIGN
page 134

AND MANY OTHER
IMPORTANT ARTICLES
SEE PAGE 5

Paul R. Screvane, Commissioner of Sanitation for the City of New York, is responsible for collection and disposal of refuse from eight million people and for street cleaning and snow and ice control. More on page 18.

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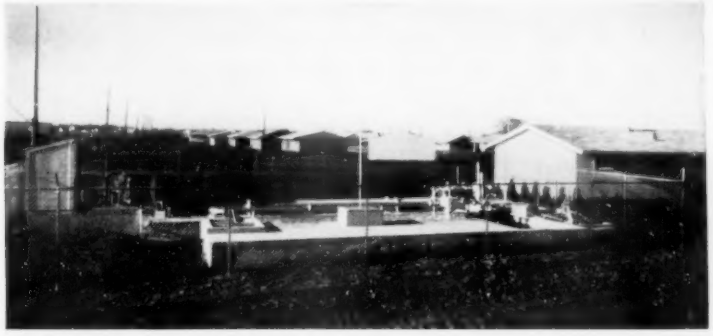

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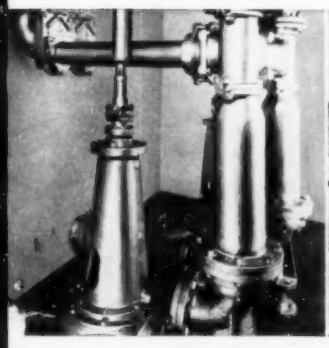

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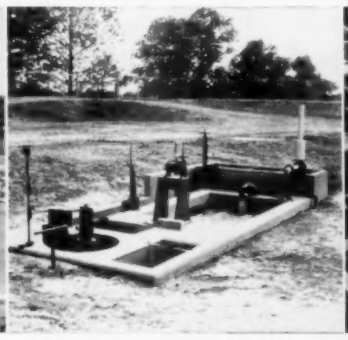

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SEPTEMBER 1958

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How a Four-Man Crew laid 1500 feet a day of

CLOW Bell-Tite® pipe

through Florida swampland

CLOW cast iron pipe, with the sensational Bell-Tite joint, proved its advantages conclusively in this Clearwater, Florida, installation.

That a four-man crew was able to lay this CLOW Bell-Tite pipe at 1500 feet a day under these adverse conditions is definite evidence of the time, labor and money-saving advantages of this CLOW-designed joint. Two men worked in the trench—often in 3 feet of water. One man lubricating and aligning the joints, the other assembling with a pinch bar. A crane operator and a hook-up man completed the crew.

CLOW Bell-Tite forms a pressure-tight joint—instantly—no bolts or follower glands required. Under practically all conditions, it is the fastest, easiest and most economical pipe for water main installation. Underwriters' Laboratories Inc. listed in diameters 3- through 24-inch.

Shows simple assembly of CLOW Bell-Tite joint. Just wipe clean, lubricate and push spigot into the bell. When painted yellow stripe is no longer visible, joint is bottle tight.

Under-water assembly of 8" Bell-Tite pipe at Clearwater, Fla.
Contractor: Hancock Pipe Company, Clearwater, Fla.

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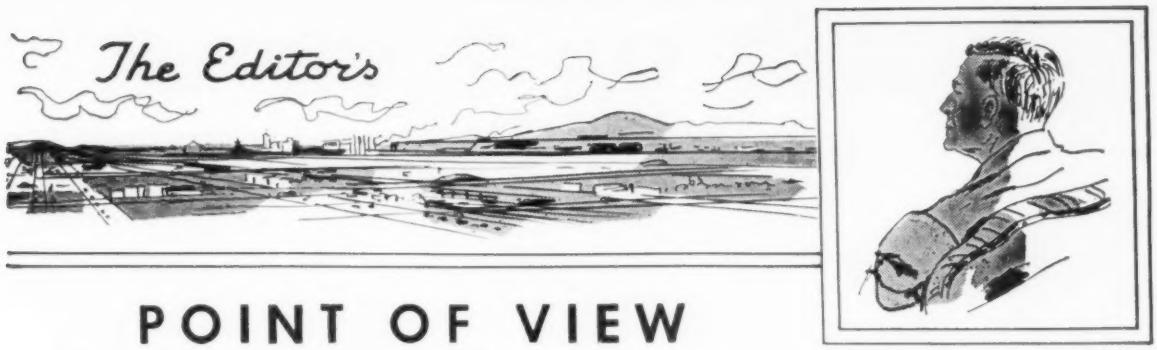


POINT OF VIEW

A Sound and Constructive Approach to The Problem of Subdivision Sewage Disposal

IN REVISING its sanitary regulations, one of our major cities has inserted a requirement that subdivisions of 15 houses or more must construct community sewage treatment facilities. While this has not yet been enacted, it is likely that it will be. It represents a courageous approach to the solution of a problem that has too long been evaded and avoided. It is estimated that individual facilities, as septic tanks and cesspools, represent 5 to 7 percent of the cost of a home. For as few as 15 homes, the cost for a system of sewers and a treatment plant may exceed the cost of individual facilities, but the homeowners will not, in a few years, have to pay for a sewer system in addition to their individual facilities.

Over the past few years there has been a marked development in package plants to handle wastes from small areas. There are several of these with considerable records of satisfactory service. Moreover, more design data is available for small plants and engineers have acquired skills in this field so that satisfactory installations are numerous. There still remains the attitude of some regulatory engineers who, it sometimes seems, would rather have no plant at all than to have a small one where suitable operating skills may be lacking or more than the very minimum of supervision may be needed. It is to be hoped that this group, too, will recognize that small plants are needed; that it is possible to provide suitable supervision for them; and that a broader and more understanding outlook is needed in the solution of this problem.

Modern Refuse Incinerators Can Have a New Look

ON ANOTHER PAGE of this issue is a four-color picture of the interior of a recent refuse incinerator. Use of color can be important in creating a feeling of pride in the men who work in the plant and can thus help toward better operation. But the use of color should not obscure the features in this plant which provide for better and complaint free performance of the job for which it was designed.

Refuse disposal is still one of the most neglected public works problems, even though the past few years have seen emphasis on better equipment for collection and better operation of disposal facilities. The marked changes in the character of refuse have affected older incinerator installations. Reconstruction can, in many cases, increase capacity and eliminate air pollution. The need exists for more and bigger incinerators and better operation, too. A training program for incinerator and landfill operators could do a great deal toward easing the problems of disposal of our unwanted materials.

Health and Sanitation for Air Travelers and at Airports

THE GREAT GROWTH of air travel—a doubling in the past five or six years—and its likely continuing increase in the coming years pose many health and sanitation problems. One, of course, is that of quarantine against such diseases as yellow fever, cholera and small pox. Though these are preventable by vaccination or inoculation, only a small proportion of the population in the United States is protected.

Over and beyond these are water supply and sewage disposal. Everyone knows that overtaxed water supply systems can be hazardous and that overloaded or inadequate sewerage treatment devices are no benefit to health. Many airports serving our cities are outside city limits and in areas where health agencies are weak or even lacking. Are sanitary engineering checks regularly or ever made on airport facilities for water, sewerage and refuse to insure detection and correction of hazards?

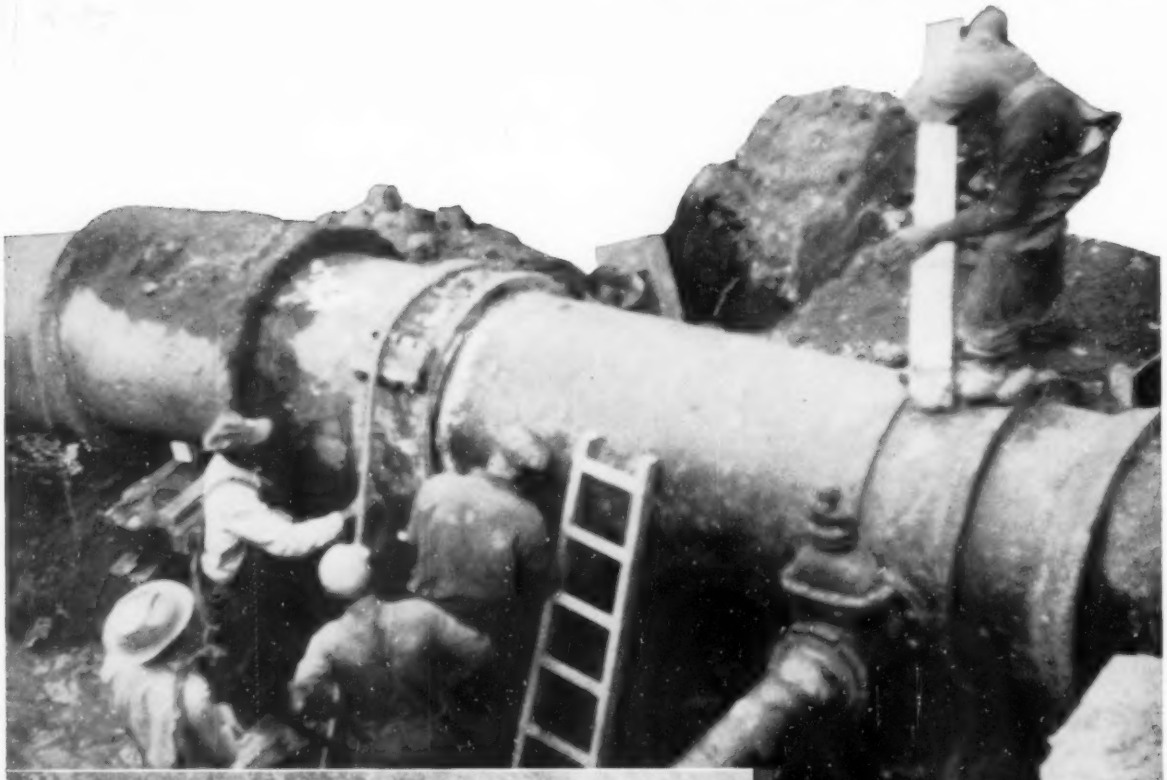
During the war, sanitary engineering examinations of hotels used by troops and, later, of ASTP designated colleges yielded some amazing data on health hazards. It would be interesting, and probably shocking, to see what similar critical inspections of airports would bring to light.

Improving Water Quality by Wholesale Reservoir Treatment

WATER RESERVOIRS undergo "turnovers" and are subject to other conditions that at times affect adversely the quality of the water. In the past, it has been necessary to provide regular or seasonal treatment or merely to suffer colored, turbid or bad-tasting water for long or short periods. A recent installation providing aeration facilities *in situ* for the water in a reservoir resulted in a considerable improvement in water quality.

Not all the good ideas have been thought of. We need more engineers with imagination and with courage to test the ideas that flow from that quality of imagination. That is how we progress.

ANY PIPE CAN PROMISE...



50 YEARS YOUNG! This 36" Cast Iron Pipe feeder main was installed in 1907. Taken up in 1954 because of relocation project, it was relaid in 1956 for a bypass line around new highway interchange.

Close-up of section of above pipe 1,958 feet of which was cleaned and reused.

MODERNIZED cast iron

CAST IRON PIPE PERFORMS!

What other pipe offers you LONG LIFE + STRENGTH + HIGH FLOW CAPACITY?

Don't doubt when you buy pipe—specify cast iron and be sure of...

1. **LONG LIFE . . .**
   42 North American cities are still using cast iron water mains laid 100 years and more ago. Hundreds more have passed the 50 year mark.
2. **BEAM STRENGTH . . .**
   Cast Iron Pipe is inherently tough . . . stands up under heavy traffic load, soil displacement and disturbance.
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   Cement lined cast iron pipe and fittings will not tuberculate . . . delivers a full flow for the life of the pipe.
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   6" Class 150 Pipe withstands a crushing load of 17,900 pounds per foot . . . nearly 9 tons.
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   Cast Iron Pipe effectively resists corrosion . . . vital factor in its long life and dependability.
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   A full range of leak-proof, low cost, easy-to-assemble joints for pipe and fittings are available for all conditions.

You've read and heard thousands of words—all selling pipe.

But make no final choice before you ask this simple question: What pipe offers you not one, not two but *all* the factors that spell long, trouble-free life and dependability.

The answer is . . . cast iron pipe. Performance made it . . . and performance keeps it . . . America's No. 1 Water Carrier.

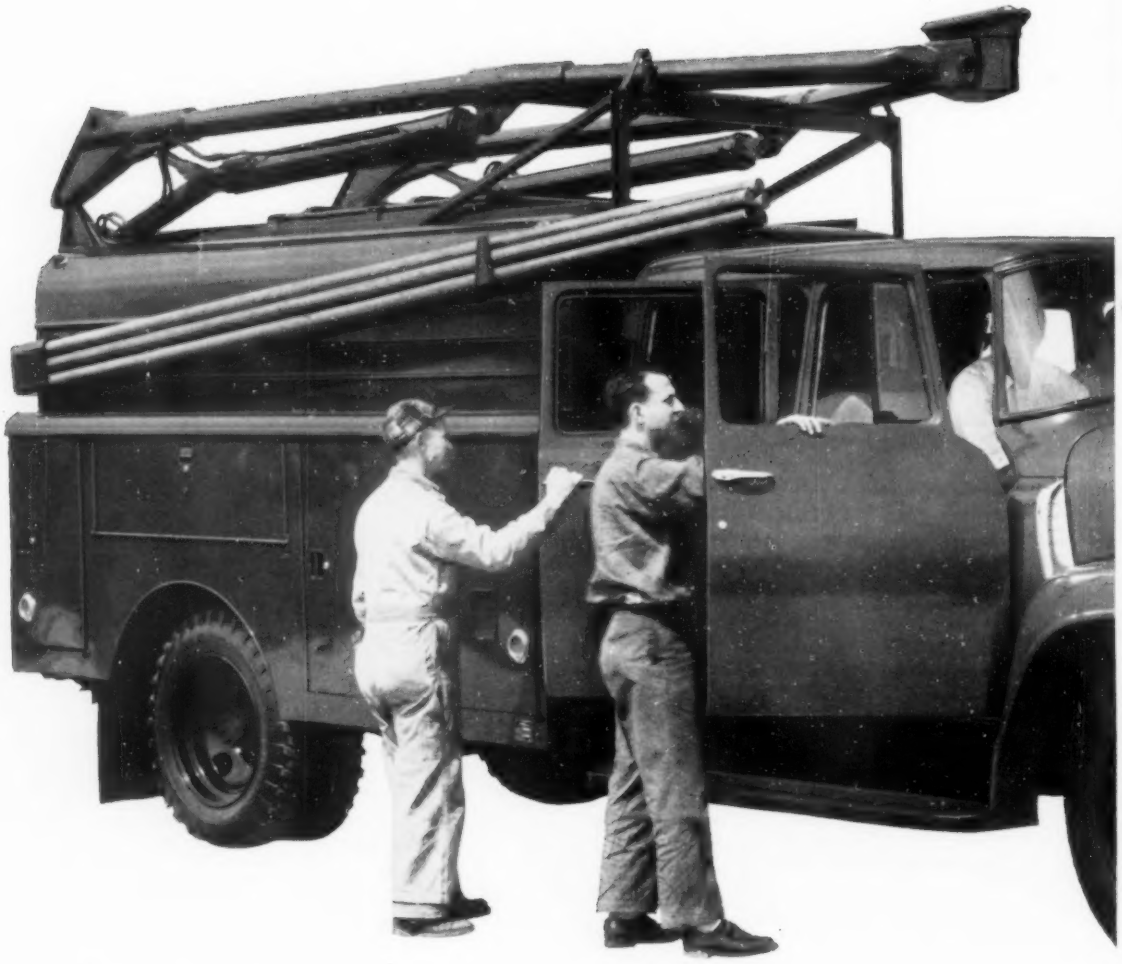
Its service record *proves* it!

THE MAN WHO CHOOSES CAST IRON PIPE TODAY WON'T PAY FOR IT AGAIN TOMORROW!

CAST IRON

Cast Iron Pipe Research Association
Thos. F. Wolfe, Managing Director
Suite 3440, Prudential Plaza, Chicago 1, Ill.

pipe FOR MODERN WATER WORKS



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NOW plenty of room for six! No crowding. Full-width front and rear seats measure five feet plus, door-to-door. Third door access to rear seat provides easy in-and-out. You move crew, materials and tools to job site in one operation, in all-weather comfort.

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NOW factory-matched construction! Travel-Crew cab and chassis are designed one-for-the-other. Factory-matched on the assembly line to give you a truck that offers precision engineered weight distribution and well-balanced styling for smoother appearance and longer life.

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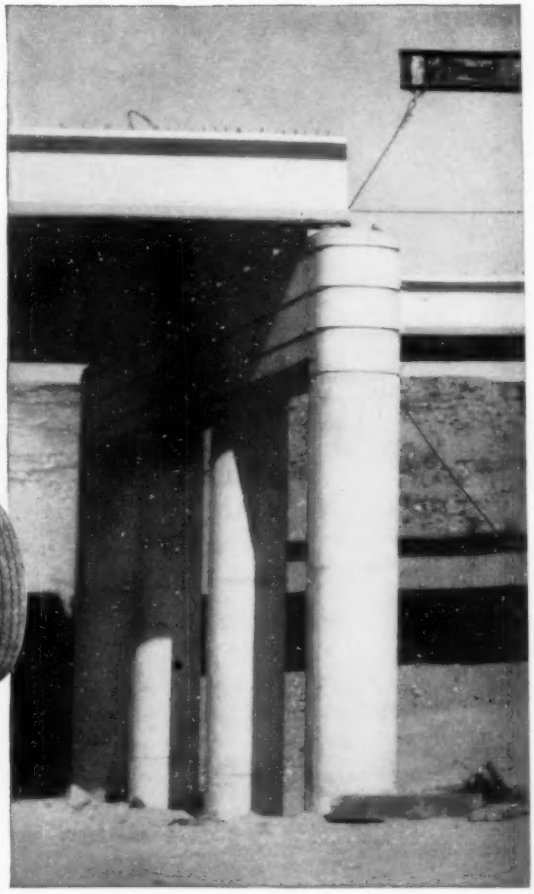
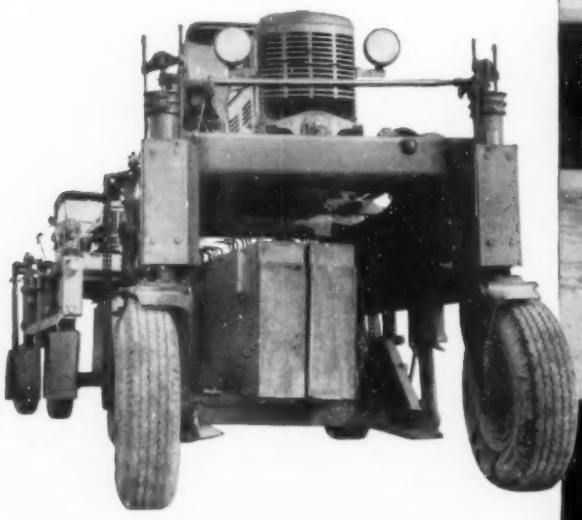
PLACING MAIN SPAN GIRDERS—A crane with a spreader beam is erecting a main span girder prestressed with USS American Super-Tens Stress-Relieved Strand. Note the ease of erection.





NEW WAY TO MOVE GIRDERS—Here a straddle truck is transporting a girder from the prestressing plant to the job. This was a time- and money-saving way to transport prestressed girders. Construction was speeded up because the girders were precast, then transported to the job site for immediate erection.

On the Garden State Parkway . . . 405 prestressed

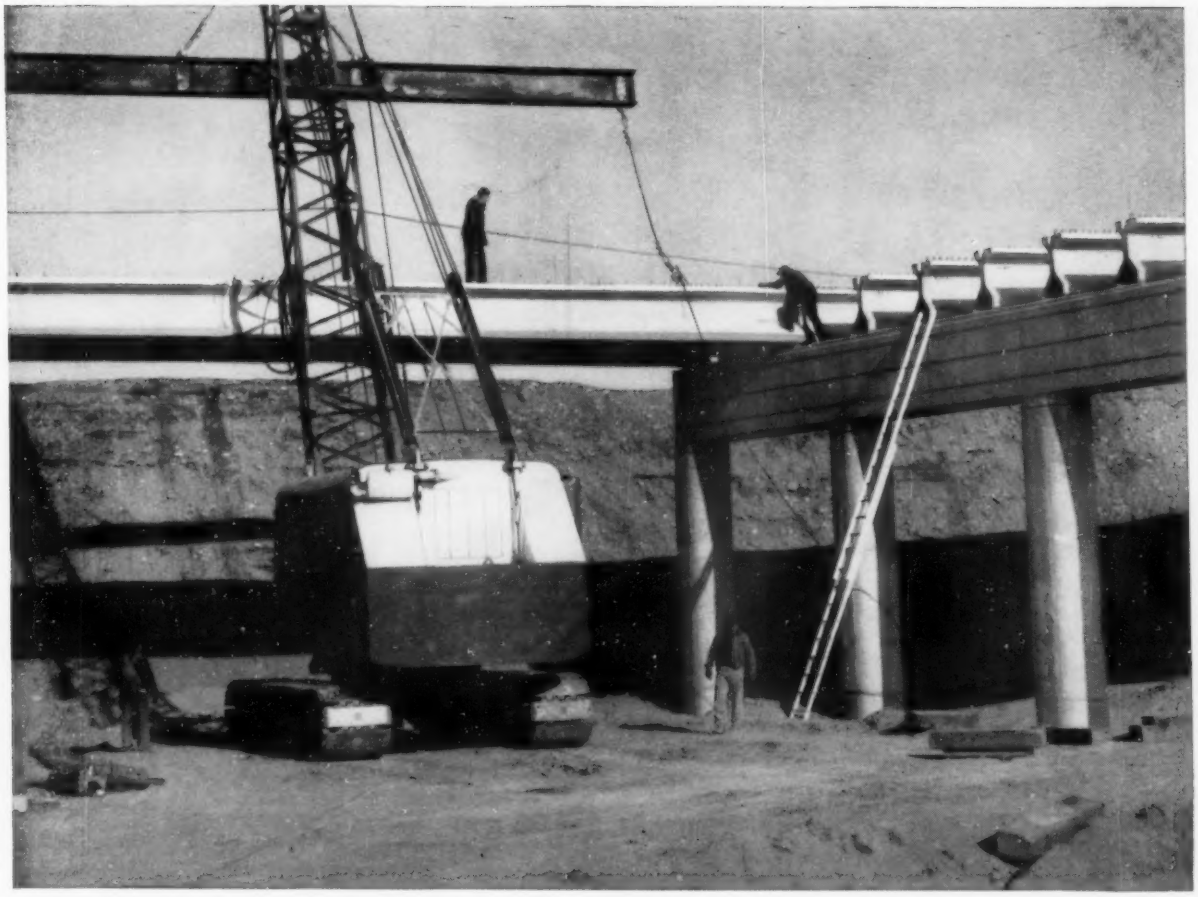
HERE IS the new USS American Super-Tens Stress-Relieved Strand reel furnished in standard sizes of 50" and 44". The new 2-ply construction resists warping and splitting, resulting in longer service life.

Linking New Jersey with New York and New England, the recently completed section of the Garden State Parkway is 9¼ miles of ultramodern highway. Along this new super-road there are eighteen prestressed concrete bridges. USS American Super-Tens Stress-Relieved Strand was used on this modern superhighway development.

The manufacturer of the prestressed beams

USS American

These people built this section of the Garden State Parkway: Design Engineers: Fay, Spofford & Thorndike, Inc., Boston, Mass. • Contractor & Manufacturer of Prestressed Beams: Reid Contracting Company, Inc., Woodbridge, New Jersey; L. W. Lancaster, Chief Engineer • Consulting Engineer for Contractor: Charles C. Zollman & Associates, Newtown Square, Pennsylvania.



beams were produced in 81 days

for these bridges produced more than 400 prestressed beams in eighty-one days.

Prestressed concrete is a proven construction material with unlimited possibilities in building roofs, floors, walls, beams, slabs, columns, and foundations, as well as for bridges. American Steel & Wire pioneered in this development in 1951 by being the *first* to develop a new product—special high tensile strength strand for the first pretensioned bridge in this country. Our engineers have much experience in this field, and they will be happy to discuss the application of prestressed concrete to your construction needs.

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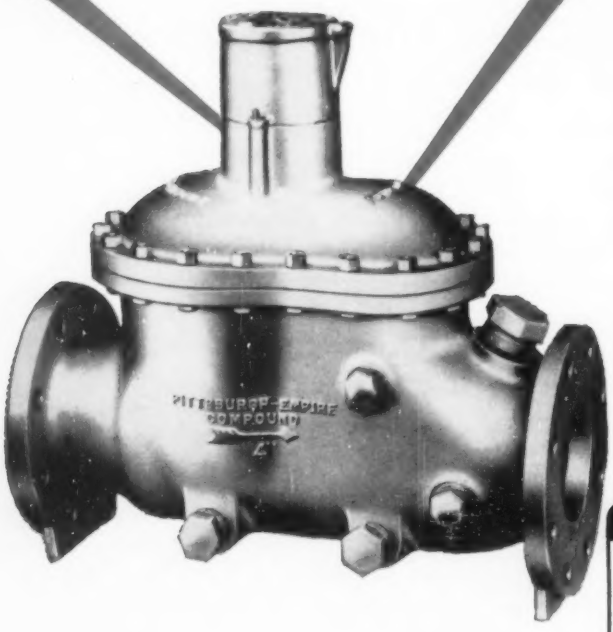

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another fine product line by

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Large Elevated Water Tanks Urged to Cut Shortage

Reserve Storage Needed

Engineer's Plan Bared

Plans were advanced here Friday for new 3,000,000 gallon elevated water storage tanks that could be used to ease the load at the two municipal water plants.

This city's consulting engineer told city officials the tanks could be filled during normal pumping conditions and put into use when water shortages occur.

The city's utilities director said water demands, caused by lack of sufficient rainfall, continued to exceed the plant's rated capacities.

A total of 26,050,000 gallons was pumped Thursday. Rated capacity of the pumping station is 22,000,000.

Horton Elevated Tanks are the answer to the need

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Horton elevated tanks with ellipsoidal-bottoms are built in standard capacities to 500,000 gallons. Radial-cone bottom elevated tanks are built in sizes from 500,000 to 3,000,000 gallons. Write our nearest office for further information, estimates or quotations.

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Above: 1,000,000-gal. Horton radial-cone bottom elevated tank built for Catonville, Maryland.

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INTERNATIONAL 240 UTILITY
38.5 HP

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45.0 HP

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. . . size and stamina to match your every power need!

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New 3-point hitch with precision Tel-A-Depth control . . . ultra-smooth six-cylinder engines for heavy-duty Internationals, 61 and 72.5 engine hp . . . Fast Reverser to speed all shuttle-type operations . . . higher-capacity built-in hydraulics . . . heavy-duty power steering . . . years ahead operating comfort and maneuverability. These, plus exclusive IH-developed Torque Amplifier drive and Fast-Hitch, let you literally "tailor" a new International to your exact power and equipment needs.

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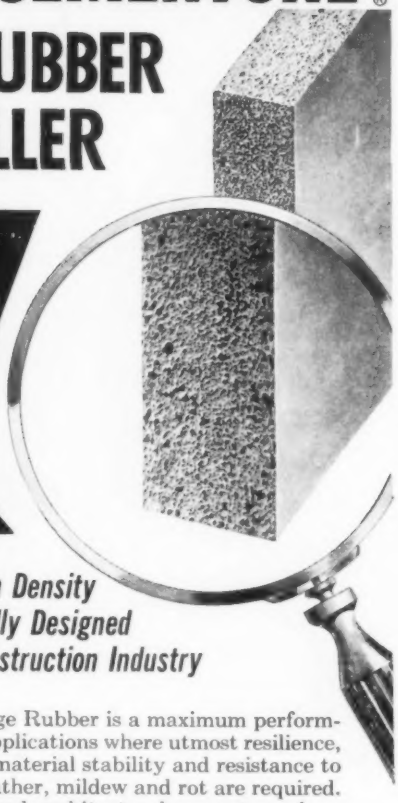

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★ Weather and Rot Resistant

★ Gray Color Blends With Concrete

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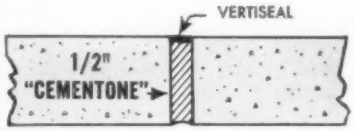
Servicised "Cementone" Sponge Rubber is a maximum performance joint filler, designed for applications where utmost resilience, non-extrusion, high recovery, material stability and resistance to the deteriorating effects of weather, mildew and rot are required. It is also widely used in exposed architectural concrete such as bridges and overpass structures, abutments, walls, etc. where its neutral gray color blends well with the color of concrete.

Because of its compressibility, high resilience and color, "Cementone" is ideally suited for use in tilt-up construction at vertical column and panel butt joints. (below)

Made from high quality blown sponge rubber, uniform in thickness and density, "Cementone" is available in cut strips or sheets in standard thicknesses of ¼", ⅜", ½", ¾" and 1" in lengths up to 10 ft. For greater thicknesses, "Cementone" may be laminated.

Typical "Cementone" Tilt-up Applications

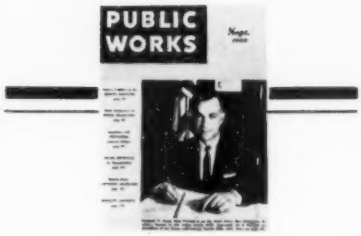
"Cementone" Sponge Rubber used on wall sections with column vertical joint.



Sealing a butt joint of precast wall panels. Vertiseal is used to seal the exterior face.

Write for the Servicised Catalog. There's no obligation.

SERVICISED PRODUCTS CORPORATION
6051 WEST 65th STREET • CHICAGO 38, ILLINOIS



Leader in Public Works

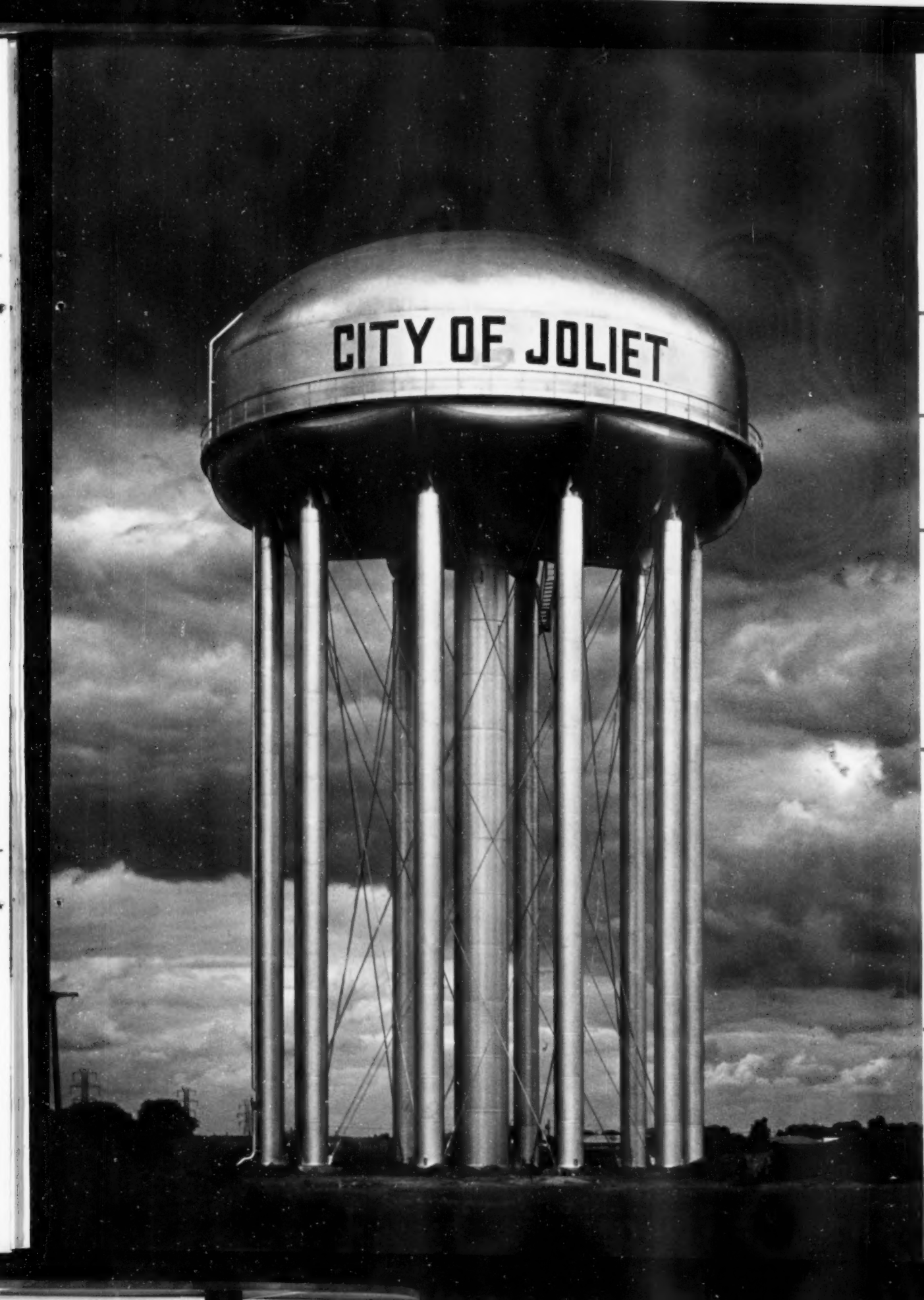
Paul R. Screvane is a career employee of New York City's Department of Sanitation with 21 years of service. He rose through the ranks via competitive examinations and in 1957 was sworn in as Commissioner of Sanitation by Mayor Wagner. As Commissioner, he is boss of a 14,000-man Department responsible for refuse collection and disposal, street cleaning and snow and ice control.

The magnitude of its task may be gauged by the fact that its 1957-58 Expense Budget exceeds $90,000,000 and its 1958 Capital Budget exceeds $11,000,000. Department forces collect 3,500,000 tons of refuse and dispose of over 4,000,000 tons. (The difference is handled by private cartmen.) Some 4800 miles of streets are scheduled for sweeping while, for snow and ice control, some 5800 miles are its responsibility.

Commissioner Screvane is past president of the New York-New Jersey Chapter of the American Public Works Association, whose annual award of merit for leadership in the field of municipal sanitation he received in 1956. He presently is chairman of the APWA Street Sanitation Committee which is engaged in preparing a textbook on street cleaning.

In World War II he enlisted as a private and advanced to the rank of Major. He served in the European theatre of operations in the field artillery and as an intelligence officer in the Third Army. At the close of the war he had been awarded the Silver Star Medal for gallantry in action; two Bronze Star Medals; and four battle stars. At present he is a Lieutenant Colonel in charge of field artillery training at the New York City Army Reserve Officers School.

Commissioner Screvane attended New York City schools and Mississippi State College on an athletic scholarship for football. He now resides in Douglaston, Queens, with his wife and their four children.



FILE REFERENCE

FACT SHEET

GRAVER®

Million Gallon Tank One of Two for Joliet, Ill. System

James P. Hennessy, Mayor
Chester B. Lewis, City Manager
Consoer, Townsend and Associates
Consulting Engineers, Chicago, Ill.
Graver Tank & Mfg. Co., Inc.
Fabrication and Erection

Type: Radial-Cone Bottom Elevated Tank
Capacity: 1,000,000 gallons
Height to Overflow: 125′
Head Range: 30′
Diameter of Tank: 78′
Built to A.W.W.A. and Consultants' Specifications
Painted. Sterilized and Cathodic Protected

THE PROBLEM

A 20% gain in population to 70,000 in 5 years, with a 40% additional increase anticipated by 1975, placed some urgency on the completion of the storage and distribution phase of a long-range water service expansion program started in 1947 in Joliet, Ill. New wells, reservoirs, pumping stations, sewer and water extensions into surrounding unincorporated areas, as well as a sewage treatment plant and intercepting sewers had been completed. Still to be accomplished was the replacement of an old, badly-corroded 200,000 gallon elevated tank. With some 90% of the city's growth taking place on the West Side, the final steps had to be taken to distribute water throughout the new system under adequate pressure.

THE SOLUTION

The solution was a new 1,000,000 gallon radial-cone bottom elevated tank riding on the West Side high service system and a new 250,000 gallon double-ellipsoidal elevated tank riding on the new open system in the East Side high service area. Graver was selected to fabricate and erect both tanks, and to paint, sterilize and provide cathodic protection for each.

The million gallon tank on the West Side, featured at the left and on the next page, will provide ample water at 53 pounds pressure for the fire protection and domestic requirements of about 60% of the present population and some 4,000 people in adjacent areas. Telemetry controls the water level in the large tank—as the water level recedes, the pumps automatically refill the tank from an underground reservoir. Should the power fail at the pumping stations, the elevated storage assures uninterrupted water service.

The fabrication and erection of these two tanks for the City of Joliet, Ill. demonstrates Graver's capacity to handle every detail of fabrication and erection of elevated water tanks of all sizes and types.

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BUILDING FOR THE FUTURE ON A CENTURY OF CRAFTSMANSHIP IN STEELS AND ALLOYS

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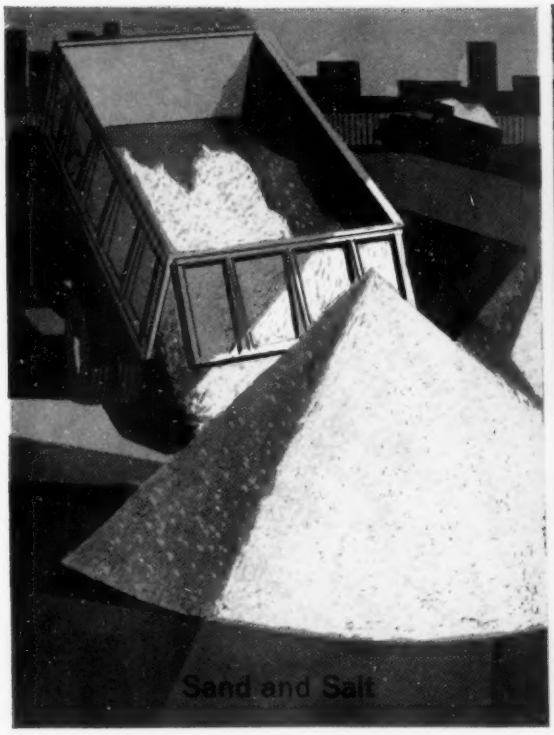

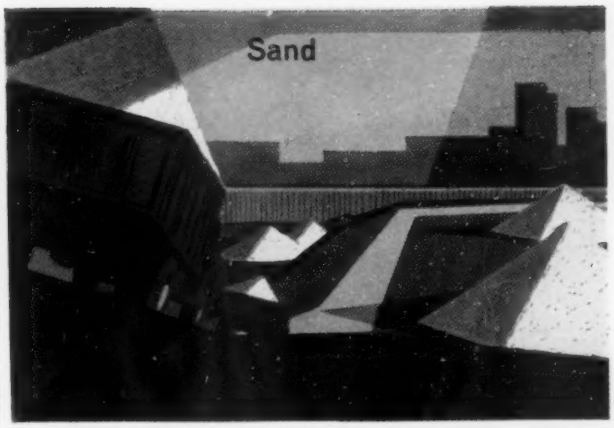

To rid streets of ice and snow . . .

Straight Morton Rock Salt does the job abrasives and mixes can't do

City officials have found that straight Morton Rock Salt is 8 times better than abrasives . . . that one man and one truckload of Morton Rock Salt does a better job of ice and snow removal than 8 men and 8 truckloads of abrasives. Straight Morton Rock Salt (rock salt not mixed with sand, cinders, or other abrasives) leaves no messy residue on streets, in gutters and sewers . . . won't blow away or leave a rutted, dirty pavement . . . needs no flushing after a thaw.

Non-toxic, easy to use, Morton Rock Salt is inexpensive. (It generally costs far less than calcium chloride.)

It pays to order Morton Rock Salt early

Smart purchasing agents, highway officials and city managers know it pays to be prepared before unexpected storms ice streets and highways. They know they eliminate confusion, extra work and accidents by stockpiling Morton Rock Salt early for winter ice and snow removal.

Send for more information today!

☐ *Please send me your free book on ice and snow removal.*

☐ *I would like a Morton representative to advise me on how best to stockpile Morton Rock Salt for my town.*

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Title_____

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Address_____

City_____ Zone____ State_____

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INDUSTRIAL DIVISION
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Chicago 6, Illinois

Consulting Engineers,
L. I. Couch Co., Indianapolis, Ind., and Carl J. Heim, Jasper, Ind.

Construction by,
Olinger Construction Co., Huntingburg, Ind.

Huntingburg, Ind.
sewage treatment plant. Photo right shows both floor and side wall blocks of clay; also vent cover block, channel covers and sewer pipe vents ready to install.

TFFI TRICKLING FILTER

SYMBOL OF GOOD TREATMENT

EXCEED REQUIREMENTS

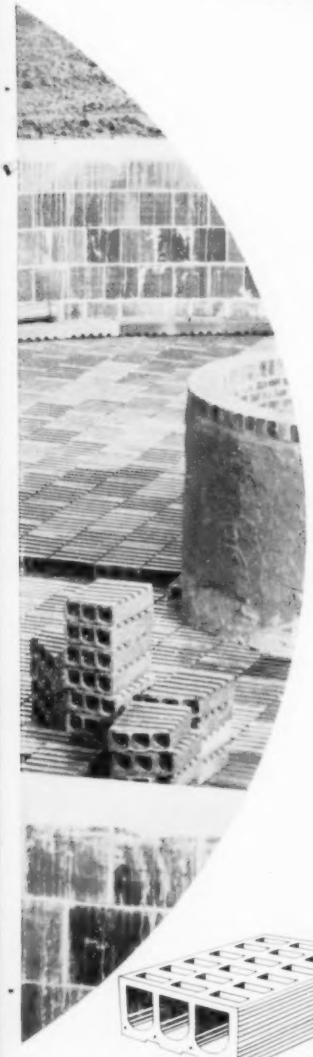
TFFI members supply vitrified clay under-drain blocks that even exceed ASTM requirements.

SPECIFICATIONS

ASTM specifications insure good trickling filter under-drains—insure that you get the best. Ask any member for a copy of approved Specifications ASTM C-159-55.

ADDRESS ANY MEMBER OF THE INSTITUTE FOR FULL DETAILS AND SUGGESTED SPECIFICATIONS FOR BLOCKS

. . . and still the trend grows to trickling filters with



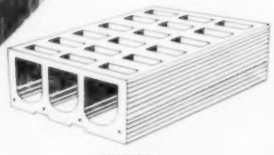
TFFI specification vitrified clay underdrain blocks for sewage treatment plants

PERMANENCE Since a Trickling Filter can be no better than its underdrain system, it is vital that the floor blocks be of vitrified clay. They guarantee permanence with protection against acids, alkalis and bacterial action that blocks made from a substitute material cannot possibly give. Ask any member below about our 50-year guarantee of vitrified clay underdrain blocks.

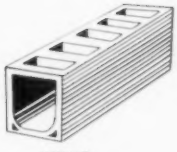
MODERN PLANTS Vitrified clay blocks are superior because they are made in modern plants under rigid controls usually impossible with substitutes.

GET THESE FURTHER IMPORTANT ADVANTAGES OF TRICKLING FILTERS:

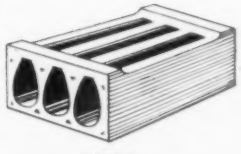
Low first and operating costs. Simple, easy operation. Long life—longer than that of the bonds issued to pay for the plant. Overload is no problem. Good results: top-notch effluent, day in and day out. Flexibility and adaptability.



DICKEY
W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.

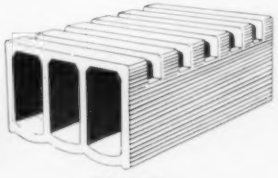


BOSCO
Bowerston Shale Co.
Bowerston, Ohio

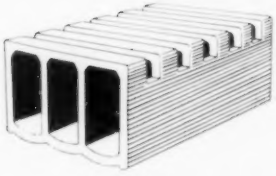


NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.

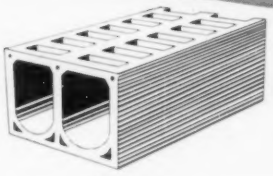
FLOOR INSTITUTE



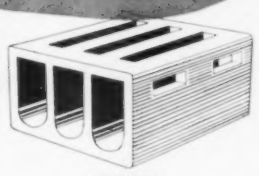
TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.



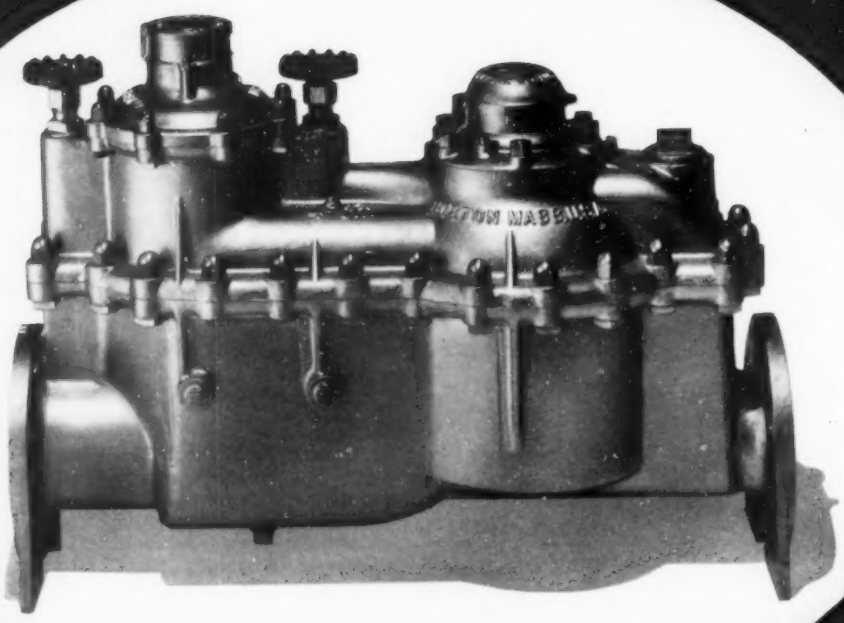
ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



POMONA
Pomona Terra-Cotta Co.
Greensboro, No. Car.

HERSEY
COMPOUND METERS

Your best buy for accurate registration at all rates of flow



ALL BRONZE CASE 2″ TO 6″ INCLUSIVE

HERSEY MANUFACTURING COMPANY

(Est. 1859)

DEDHAM, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
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A coating in COLORS that really sticks to new Galvanized, Aluminum and Terne Plate

RUST-OLEUM®
GALVINOLEUM® COATINGS

Remember? If you didn't go over every square inch of new galvanized metal with a chemical solution before painting . . . chances are that the paint "peeled off" leaving you with a costly eye-sore!

The development of Galvinoleum Coatings by Rust-Oleum changes all this! *Now* . . . you simply brush Galvinoleum right over brand new or unpainted Galvanized, Aluminum, or Terne Plate . . . no etching . . . no weathering . . . and it *lasts and lasts!* No "peeling" worries, no costly "headaches"... you have your choice of Red, Gray, Green, and Metallic! And you can use Rust-Oleum 575 Outside White, or any high-quality oil base house paint, over the Galvinoleum to match trim.

Pioneered, developed and field-tested by the Rust-Oleum Corporation — you have the assurance of a *brand name* backed by over thirty-five years of proved performance throughout industry. Try Galvinoleum... write for your illustrated Galvinoleum booklet with color charts.

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Prompt delivery from Industrial Distributor Stocks.

Rust-Oleum is distinctive as your own fingerprint. Accept no substitute.

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☐ Complete Rust-Oleum Galvinoleum Literature With Color Charts.

☐ Free Test Sample:
☐ Red ☐ Gray ☐ Green ☐ Metallic

☐ Nearest Source of Supply.

Exclusive all-phase sanitary landfill efficiency!

—for Burlington, No. Car. (Pop. 30,000)

Clamshell action enables picking up and spot-placing bulky refuse, without disturbing already compacted material. Even such hard-to-handle cast-offs as old tires or tree-stumps are easily handled with this 4-In-1 "clam" action.

"Carry-type scraper" action provides the exclusive, easily-controlled means of spreading "cover" evenly over the layered refuse—on the go. You simply regulate the amount of earth placed by controlling the clam lip opening.

Skid-Shovel action of the 4-In-1 lets you "iron down" the cover using the load-weighted bucket—plus hydraulic down-pressure of the compactor plate. This produces the positive compaction to eliminate rat-havens, "mosquito hatcheries," and stench pockets!

Your city can have up to double the efficiency of ordinary land-fill equipment—with an International Drott 4-In-1 or Bullclam. See how much extra utility, too, the 4-In-1 will give on street and park duties, and producing sand, gravel, or rock! Ask your International Drott Distributor for a 4-In-1 demonstration.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

Bulldozer action permits spreading refuse in uniform layers—for easy compaction and thorough covering. With clam lip up and skid-shoes on the ground, the International Drott 4-In-1 is positioned for big-capacity refuse blading. These four TD-14 4-In-1 landfill scenes show how Burlington, North Carolina, handles refuse disposal for its 30,000 citizens. Daily collections total 400 cubic yards of packed rubbish and garbage.

"Our 4-In-1's versatility is adaptable to every phase of sanitary landfill operation, assuring fill compaction and coverage of refuse," states Richard F. Moore, Burlington's Supt. of Sanitation.

Versatility unlimited...all over town!

Part time on the sanitary fill—part time on streets, drives, parks, and playgrounds—that's the routine for many city-owned International Drott 4-In-1's. This TD-14 4-In-1 is removing old street surfacing materials. Other popular city jobs for 4-In-1's are loading sand and gravel, installing culverts and landscaping!

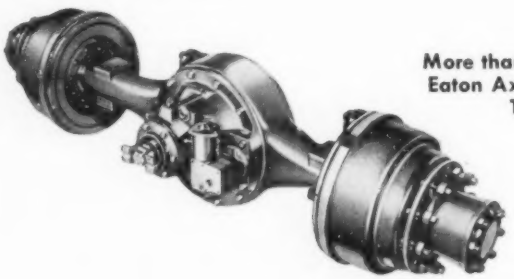
With up to twice the refuse-handling capacity of "single-action," limited-duty rigs, International Drott Bullclams provide amazing efficiency and economy. Bullclams are recommended for the larger cities needing the full-time service of a specialized, big-capacity refuse disposal machine. The TD-18 Bullclam shown is using compactor plate action to pack and seal refuse on a Fort Worth, Texas, landfill!

3 to 10 times longer life!

EATON INDUCTALLOY AXLE SHAFTS

Eaton Inductalloy Axle Shafts, hardened by the Eaton induction hardening process which produces an extremely hard case that extends deep into the material structure, are able to handle more pounds of torque without fatigue failure. The result is extra thousands of trouble-free miles added to axle life, more vehicle time on the road—less in the shop, and reduced maintenance expense.

The superiority of Eaton Inductalloy Shafts is performance proven by millions of miles of heavy duty operation. Ask your dealer for complete information.



More than Two Million Eaton Axles in Trucks Today

EATON INDUCTALLOY SHAFT

ORDINARY AXLE SHAFT

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AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO

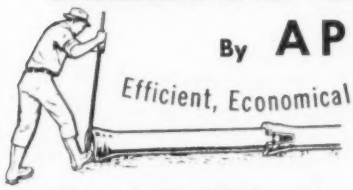
PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Motor Truck Axles • Permanent Mold Gray Iron Castings • Forgings • Heater-Defroster Units • Automotive Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Gears • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

For The Best Connection You'll Ever Make—

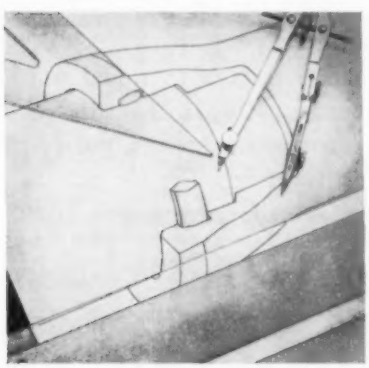
ALTITE JOINT

By APCO

Efficient, Economical and Fool Proof—



The **ALTITE JOINT** has been subjected to a series of rigid tests much more severe than are encountered under the most extreme installation and service conditions in the field. Even under extreme conditions, this joint is so simple to install—you could hardly go wrong if you tried.



Underwriters Approved
Patent Applied For.

For efficiency, Economy and Simplicity—

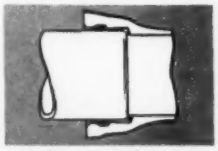
Order ALTITE For Your Next Job

Four Operations As Simple As Falling Off a Log—

Insert Rubber gasket in bell end of pipe — you can't put it in wrong — A child can do it.

Wipe on a small amount of special lubricant—This reduces friction.

Insert plain beveled end of pipe — there are no grooves, ridges or tips on gasket to interfere with smooth insertion.



Small amount of pressure required to force plain end to bottom of socket—Your simple, time saving joint is completed.

SALES OFFICES

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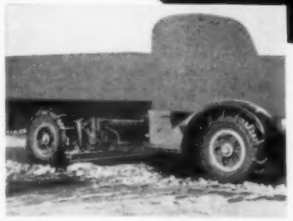
Kansas City, Missouri

18505 West Eight Mile Road
Detroit 41, Michigan

ALABAMA PIPE COMPANY

General Offices — ANNISTON, ALABAMA

COMPLETE
ICE AND SNOW
WAUSAU
FIGHTING
EQUIPMENT



TRUCK GRADER ICE BLADE

Maintains, cuts and grades all types of gravel and dirt roads, eliminates ruts, holes, and washboards. For winter operation it planes, breaks, and removes ice and hard-packed snow hazards . . . truly a versatile year 'round maintenance unit . . . full power hydraulic cab control.

MATERIAL SPREADER

Quick action spreading is a feature of this low cost self-contained unit that may be attached or disconnected in a minute. It has positive control of thickness, width, and direction of spread . . . operates only when body is raised — stops when body is lowered . . . no hazard to passing vehicles . . . sturdily built throughout for long service . . . width of spread 8 to 20 feet — hopper capacity 2 cubic feet.

SNOW PLOWS....

55 MODELS AND 9 STYLES

WAUSAU specialists in snow plows . . . 55 models and 9 types to select from . . . equipped with the finest of a full range of hydraulic controls to meet your individual requirements . . . will take more punishment, cost less to operate, and do the job better.

Write: today for the name of your nearest WAUSAU distributor who will assist you in getting year 'round maintenance equipment to fit your needs.

WAUSAU IRON WORKS WAUSAU, WISCONSIN

Pioneer Snow Plow Builders

Truck Patrol Ice Planer and Material Spreaders

12-MONTH REPORT FROM BIRMINGHAM, MICHIGAN:

Ford Tractors Worked 1178 Hours on

Ingenuity at work—Charles W. Gale, left, Superintendent of the Department of Forestry and Parks at Birmingham, is an 11-year veteran in this field. He and assistant Harvey Rash, using radio, are charged with keeping their Detroit suburb in tip-top shape . . . and as is usually the case, on a limited budget. Their answer to the problem involves detailed time and cost records, careful scheduling of work priorities, and maximum use of ingenuity in getting the most efficient use of their 22-man labor force and two Ford Tractors.

Make way for action! Work never stops in maintaining the neat, trim appearance of this town of 25,000 people. There are 4½ square miles of Birmingham —81 miles of streets, 25,000 city trees, three nurseries, five parking lots, 300 acres of park and recreation areas at 15 different locations, 31 baseball diamonds, a 58-acre golf course, archery range, police pistol range, cemetery, ski-sled run, five ice rinks, a city-owned lake and a sometimes rampaging river.

1 Discing at nursery. Ford Tractors also are used for cultivating, and in later months, to tow 500-gallon watering unit.

FORD *HUSTLES* in the Spring

2 Aerating. Department maintains 300 acres of parks and recreation areas. Wood chips at base of trees eliminate hand trimming.

6 Sinking stakes to anchor trash cans. Cans are locked to stakes, are easily removed. Losses and over-turning are at a minimum.

7 Peeling driveways ahead of heavy equipment in roadside improvement program. Strip nearly a mile long was landscaped.

8 Ripping same strip after compacting of heavy machines. City maintains an 81-mile network of streets, 52 miles of it paved.

Dozens of Jobs... Cost 40¢ an Hour!*

*Includes all gasoline, oil, repair parts and repair labor

Months Used	Equipment	Hours Used	Gas Gals.	Oil Qts.	Repair Parts	Repair Labor	Direct Expense	Depreciation*	Total Cost	Cost Per Hour Without Deprec.	Cost Per Hour Including Deprec.
12	'55 Ford Tractor	643½	653	9	$50.96	$117.00	$265.52	$229.32	$494.84	41c	77c
9	'51 Ford Tractor (traded)	263½	290	24	20.57	91.80	165.99	156.38	322.32	63c	$1.22
3	New Ford Tractor w. Loader	271½	241	10	–0–	–0–	36.08	94.68	130.76	13c	48c

*Birmingham figures depreciation for all tractors on basis of 5-year use with fixed 25% salvage estimate. *Actual* trade-in value of last two Ford Tractors was 36%, however. New tractor bidders were required to quote cost both with and without trade-in to prevent distortion of trade-in values.

OPERATING COST — OTHER EQUIPMENT	
EQUIPMENT	COST/HOUR
Wheel tractor (less power than Ford)	$1.30
Diesel tractor	4.26
Loader unit X	2.07
Loader unit Y	2.43
Truck crane	4.10
Roller unit X	2.24
Roller unit Y	2.88
Grader X	3.28
Grader Y	5.64

Used first Ford 20 years! "Birmingham bought its first Ford Tractor in 1929 and used it continually until it was traded for a new Ford in 1949," reports Mr. Gale. "We don't attempt to use a tractor that long with the grueling work schedules of today, but we do know Fords still have excellent trade-in value after our usual 5-year use period. Add to this the versatility Ford offers for our wide range of job coverage, plus the proof of Ford Tractor operating economy revealed by our detailed cost studies. It's easy to see why Birmingham has continued to buy Ford Tractors for almost 30 years."

3 Planting trees to establish a city nursery. City has many new varieties—London Planes, Chinese Ginkgoes, Upright Locusts, etc.

4 Landscaping. Among more common trees, city uses Sugar Maples, Pin Oaks, Norway Maples and its many varieties.

5 Shallow trenching for temporary heeling-in of new trees at another nursery. Backfilling is done later with same loader bucket.

9 Leveling top soil. Birmingham maintains 800 nursery trees for city landscaping projects such as this one.

10 Fertilizing and seeding. "Street trees" such as the ones along this strip make up 60% of the 25,000 trees maintained by city.

11 Cultipacking the strip as finish operation. Home owners along the improved roadway are responsible for mowing grass.

12 Removing trees. Tongs on loader hold stumps of dead, diseased or storm damaged trees for sawing after they are winched over.

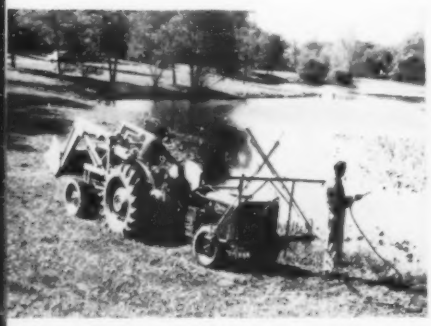
13 Towing one of eight portable bleachers which seat total of 800 spectators. Loader lifts bleacher so wheels can be snapped off.

14 Mowing police pistol range, which was easily and cheaply converted from waste land. High bank, open country are safety factors.

15 Spraying elms in Birmingham disease control program. Extra drum of spray carried in loader bucket saves return trips to garage.

FORD *HUSTLES* in the Summer

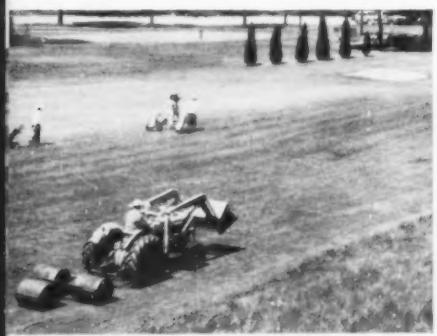
16 Dressing skin on one of 31 ball diamonds. Each diamond gets heavy play, is given half-hour working over three times a week.



17 Spraying 2-4-D on 14-acre Quarton Lake. Spray booms can be extended for tow-spraying at parks.

18 Towing mower trailer. Tractor and trailer get all specialized mowers to jobs where needed in one quick trip.

19 Sinking fence posts to uniform height at newly built archery range. Total cost of range, excluding land, was $300.



20 Pulling rollers at city golf course. General duty tractor is used without button tread tires, other equipment commonly used by golf courses.

21 Enlarging sand trap. Department took over 9-hole course management 2 years ago, cut work from 8000 to 7000 man hours yearly.

22 Gang mowing. Ford also helps in grading, sodding, fertilizing, brush clearing, materials handling, many other kinds of work.

23 **Cutting steps** for new ski-sled run. Steps then seeded against erosion. Ford also used in brush clearing, dirt moving.

24 **Pruning** trees at cemetery. City trims more than 1100 trees a year. Branches become chips; save buying mulch.

25 **Repairing** playground equipment. Tractor with auger helps set the equipment, helps sink barrier posts.

26 **Fertilizing** is done in Fall and Winter, is scheduled for slack work periods. Extra bags in loader bucket save trips to supply source.

FORD *HUSTLES* in the Fall

27 **Loading** topsoil, heavily stockpiled in the Fall. This solves availability problem for Spring planting, when topsoil is hard to get.

28 **Loading** chips for nursery mulching. City makes special collection of Christmas trees, extra good for mulching after one-year weathering.

29 **Relocating** parking meters. City also maintains five parking lots. Tongs and ⅝" grab hook are used often with versatile loader.

30 **Moving** stumps to dump for burning. Stumps are held at central point until long haul to dump can be made as "rainy day" project.

31 **Sawing** elm logs for easier burning at dump. Trees are hauled and burned at city expense, part of its Dutch Elm disease control work.

32 **Compacting** pile for burning. To restrict the spread of elm disease Michigan State Law forbids keeping dead elm wood on private property.

33 **Augering** holes for Police Department traffic signs. Tractor and operator are "rented" to other departments for $3.20 an hour.

34 Repairing trees, in this case, painting a cleaned-out cavity. Loader also serves as basic unit for cabling jobs.

35 Loading hydrant for Water Department. Loader is commonly used for handling valves, other bulky items.

36 Leveling dirt dumped by trucks in landfill operation near river. Front loader and rear blade team for double duty.

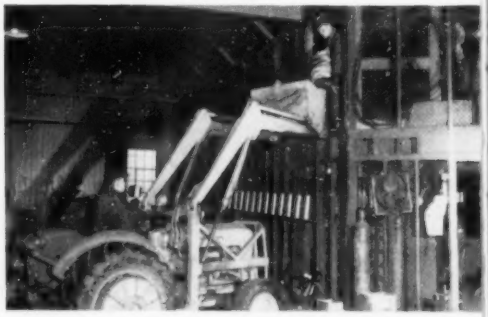
37 Clearing snow from artificial rink. Broom follows blade, cleans holes and cracks in ice. Also cleans sidewalks.

FORD HUSTLES in the Winter

38 Dumping rink snow over fence. Entire rink must be cleared of snow and "hot mopped" in less than 40 minutes.

39 Planing ice to 3" thickness above plastic pipes. Heavy planer is chained into loader bucket for quick convenient transport.

40 Installing temporary lights. Loader also used to help with painting, Christmas decorating, sign erection, many other types of overhead work.



41 Loading calcium chloride from overhead storage. The salt is used to make brine at rink. Unit also loads bulk salt and sand into trucks.

42 Lifting log snag from river in continuing flood control program. Snakelike stream at golf course also demands frequent attention.

43 Transplanting balled nursery stock. Heeling-in beds made economical use of what originally had been "waste area" on DPW grounds.

44 Setting up picnic benches in preparation for Spring. Birmingham leaves play equipment up year-around, gets steady use.

These are only 44 of a hundred or more ways Ford Tractors help Birmingham keep "on top" of the work with 25,000 city trees... three nurseries... five parking lots... 15 parks... 31 ball diamonds... 81 miles of landscaped streets... archery range... city-owned lake... river... five ice rinks... ski-sled run... police pistol range... cemetery... 58-acre golf course...

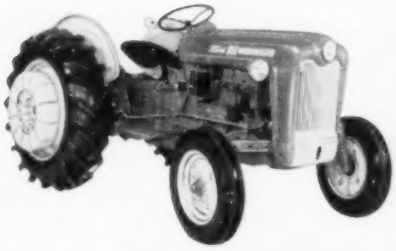
Now FORD Offers a Complete Line of Tractors With Even More Versatility, Power and Economy!

12-Speed Mobility—Available in all three tractor series. 12 forward speeds ranging from 1 m.p.h. to over 20 m.p.h. . . . 3 reverse speeds . . . 3 PTO speeds.

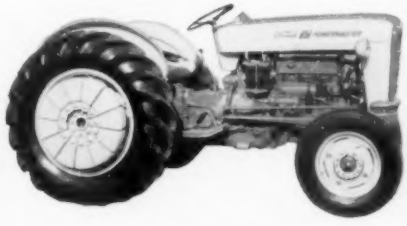
Work-Easy Power Steering—Available for all models in the three new Ford Tractor series.

Adjust Tractor Weight according to job needs with Ford's exclusive "Vari-Weight" system (sold separately).

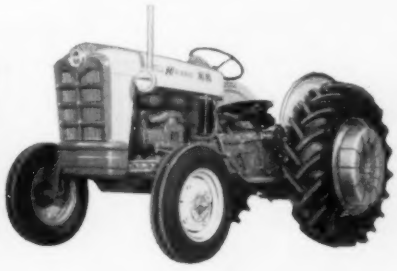
Get Full Details on these and other outstanding Ford Tractor features from your nearby Ford dealer, or write to Industrial Sales Department, Tractor and Implement Division, Ford Motor Company, Birmingham, Michigan.



Five New Workmasters! Lowest cost work horsepower of any tractor in their power class. Designed with more mobility, more ease of handling, and more new styling and performance "extras" than Ford has ever before offered in tractors of this class.



Four New Powermasters! The most powerful tractors in Ford history. Here again Ford offers more time, man and money-saving features than ever before in its huskiest tractor series. All Powermasters (and Workmasters) can be equipped to use LP-Gas.



Four New Diesels! Lowest priced diesel tractors in their power class! All the easy convenience and excellent performance of Ford gasoline tractors, *plus* the unmatched fuel economy of diesel operation. Direct injection design for easy starting and peak economy.

Stretch your budget... conserve your manpower... handle more jobs... at less cost. Let your Ford Tractor and Equipment Dealer prove to you versatile Ford Tractors will hustle through dozens of jobs for pennies an hour. He'll welcome your call... why not phone him right now!

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FORDS

BECAUSE THEY SAVE MORE MONEY!

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NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Lining of Building Stacks in the Operation of Incinerators

555. Monolithic linings for full protection of stacks and breechings are covered in literature from Plibrico Co., 1800 Kingsbury St., Chicago 14, Ill. Illustrations picture and briefly describe typical installations. Check the reply card.

Manhole Cover Seal For Firm Seating and Silencing

556. Hallemite cover seal is a rubbery, plastic material which cushions manhole covers, sewer lids, catch-basin grills and other highway castings in their frames. Check the reply card or write The Hallemite Mfg. Co., 2446 West 25th St., Cleveland 13, Ohio, for literature.

Steel Sheeting For Trenches, Cofferdams and Cutoff Walls

557. Catalog SH-465B from Armco Drainage & Metal Products, Inc., Product Information Service, Middletown, Ohio, discusses two types of sheeting, flange and interlocking. Physical properties and driving data are given, and typical jobs are described and illustrated. Also included is a method of figuring size and spacing of wales and struts. Check the reply card.

High Pressure and Mist Sprayers

579. Trailer mounted units and skid mounted sprayers are covered in 32-page catalog from John Bean Div., Food Machinery and Chemical Corp., Lansing 4, Mich. Check the reply card for data on sprayers for weed and brush control.

Slip-On Fittings For Guard, Stair and Protective Railings

576. Speed-Rail Slip-On fittings are designed to slip on the pipe and provide an inexpensive method of railing assembly. Check the reply card or write The Hollaender Mfg. Co., 3841 Spring Grove Ave., Cincinnati 23, Ohio, for details on these aluminum fittings.

Water Measurement and Recording Instruments

582. Bulletin No. 314-1 covers water control equipment with emphasis on propeller meters and their construction features. Recorders and their application and remote controlling are also covered. Check the reply card or write Sparling Meter Co., 201 North Temple City Blvd., El Monte, Calif.

Teeth for Dippers, Buckets Trenching Machines and Rippers

598. Complete data on teeth for shovel dippers, hoe, clamshell, dragline and loader buckets and rippers and scarifier attachments are covered in catalog from H & L Tooth Co., 1540 So. Greenwood Ave., Montebello, Calif. Check the reply card for ordering charts and specifications.

Auger to Bore Holes Under Streets, Highways and Railroads

561. Self powered, compact and portable hydraulic feed pipe line auger is described in bulletin from Moorlane Co., 409 East Archer St., Tulsa 1, Okla. Check the reply card for this self-contained boring unit.

Sweeping Brushes For Street and Highway Sweeping

564. Danline Brushes have a core with end flanges and axle pins, reusable circular spacers and circular brush sections. Write Newark Brush Co., 260 Michigan Ave., Kenilworth, N. J., or check the reply card for typical specifications.

Book Describing Methods of Aggregate Preparation

565. A 40-page book describing methods of aggregate preparation, beneficiation and handling has been prepared by Wemco Products Div., Western Machinery Co., 650 Fifth St., San Francisco 7, Calif. Check the reply card for complete engineering data.

Nordberg Four-Cycle V-Type Engines

570. The complete line of Nordberg four-cycle V-type engines is described in a two-color, 18 page bulletin from Nordberg Mfg. Co., Milwaukee 1, Wisc. Specification sheets, examples and photographs of the engines are included. Check the reply card.

Acker All-Purpose Earth Auger

575. Bulletin 40-r describes the Acker earth auger, which has wide application in soil sampling work, core drilling and general purpose earth augering. Write Acker Drill Co., Inc., P. O. Box 830, Scranton, Pa., or check the reply card for your copy.

Steel Storage Files For Engineering Offices

581. This 16-page, 2-color catalog covers steel storage files and illustrates the wide range of sizes and styles. Check the reply card or write Diebold, Inc., Canton 2, Ohio.

Equipment For Sewage Disposal Plants

585. Sewage gas meters, gas regulators, lubricated plug valves and water meters are described in Bulletin C-5200-3, available from Rockwell Mfg. Co., Meter and Valve Div., 400 N. Lexington Ave., Pittsburgh 8, Pa. Check the reply card.

New Hydraulic Principle For Circular Settling Tanks

593. The Rex Rim-Flo clarifier employs a unique, thoroughly-proven hydraulic principle to assure most effective settling. Check the reply card or write Chain Belt Co., Milwaukee 1, Wisc., for specifications and operating data.

Manual on Planning Concrete Form Work

594. A comprehensive manual showing the latest engineering products and proven methods of concrete forming devices for both light and heavy construction is available from Williams Form Engineering Corp., 1501 Madison Ave., S. E., Grand Rapids 7, Mich. Check the reply card.

Root and Fungus Control in Sanitary Sewers and Storm Drains

597. This 24-page bulletin covers the use of copper sulfate for root and fungus control in sanitary sewers and storm drains. Check the reply card or write Phelps Dodge Refining Corp., 300 Park Ave., New York, N. Y., for this helpful guide.

MORE LISTINGS ON PAGES 38 TO 56

Steel Standpipes and Reservoirs

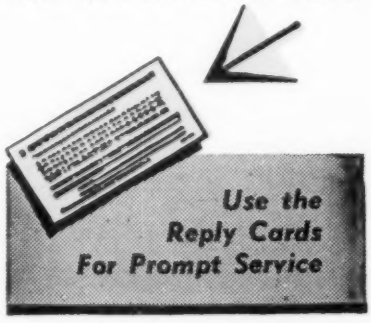
600. Literature is available from Plate and Welding Div., General American Transportation Co., 135 South La Salle St., Chicago 90, Ill., on steel storage systems that are elastic to protect against cracks when settling occurs, are not damaged by frost and are lightweight. Check the reply card for full details.

Literature on Sand and Cinder Spreaders

601. Henderson spreaders have powerful conveyor drive, dependable distributor assembly, heavy-duty conveyor chain and spread from 8 to 32-ft. in width. Write Henderson Mfg. Co., Cedar Rapids, Ia., or check the reply card for information.

Filter Sands and Under Drain Gravels

614. Filter sands and gravels for municipal water plants are described in literature available from Eau Claire Sand & Gravel Co., Eau Claire, Wis. Check the reply card for data on sizes available, silica content and content of magnesium, calcium carbonates and iron oxides.



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Stillwater, Okla., Sept. 24-25

North Central Section, AWWA
Duluth, Minn., Sept. 24-26

Pacific Northwest Section, FAS&IWA
Spokane, Wash., Sept. 25-27

Missouri Section, AWWA and FS&IWA
Jefferson City, Mo., Sept. 28-30

Alabama-Mississippi Section, AWWA
Biloxi, Miss., Sept. 28-Oct. 1

Public Works Congress & Equipment Show
Kansas City, Mo., Sept. 28-Oct. 1

National Highway Conference for County Engineers and Officials
Kiamesha, N. Y., Sept. 29-Oct. 1

National Institute of Governmental Purchasing, Inc.
Boston, Mass., Oct. 5-8

Federation of Sewage & Industrial Wastes Associations
Detroit, Mich., Oct. 5-9

17th Annual Ohio Short Course on Roadside Development
Columbus, Ohio, Oct. 7-10

American Society of Civil Engineers
New York, N. Y., Oct. 13-17

Iowa Section, AWWA
Des Moines, Iowa, Oct. 15-17

American Bridge, Tunnel & Turnpike Ass'n.
Richmond, Va., Oct. 15-18

Florida Sections, AWWA and FS&IWA
North Miami Beach, Fla., Oct. 19-22

International City Managers Ass'n.
Dallas, Texas, Oct. 19-23

National Safety Congress & Exposition National Safety Council
Chicago, Ill., Oct. 20-24

National Slag Ass'n.
Washington, D. C., Oct. 21-22

Virginia Highway Conference
Lexington, Va., Oct. 23-24

New Jersey Section, AWWA
Atlantic City, N. J., Oct. 23-25

American Institute of Planners
New York, N. Y., Oct. 26-30

World Meeting of International Road Federation
Mexico City, Mexico, Oct. 28-31

California Section, AWWA
Los Angeles, Calif., Oct. 28-31

Institute of Traffic Engineers
Miami Beach, Fla., Nov. 11-13

American Ass'n. State Highway Officials
San Francisco, Calif., Nov. 28-Dec. 5

American Municipal Ass'n.
Boston, Mass., Nov. 30-Dec. 3

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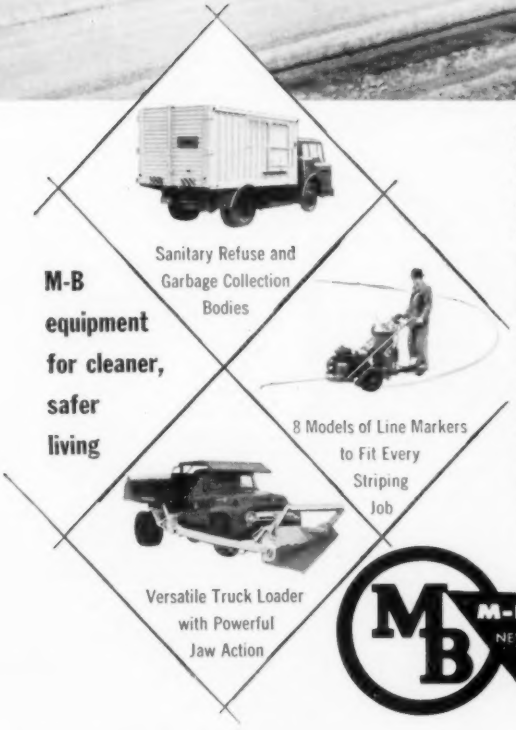
▲ Low cost mechanical drive sweeper clears snow from parking lot. Has 30° sweeping angle; adjustable broom ground pressure; 5′ and 6′ brush lengths.

▼ Note clean path behind loader-mounted hydraulic sweeper on city street. The sweeper head is quickly interchangeable with the loader bucket.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Versatile Truck Loader with Powerful Jaw Action

Be prepared when snow comes with low cost, effective M-B Sweepers! These powerful sweepers bite into snow up to 6″ in depth, leaving a clear path behind . . . even on uneven surfaces like old sidewalks. M-B Sweepers are best for fast snow removal from sidewalks, (unlike plows, will not tear up grass or shrubs) streets, shopping centers, playgrounds, skating rinks, parking lots, and airports. ▪ M-B Sweepers fit most popular make tractors, tractor loaders and Jeeps, are simple to attach and remove, and give you a complete year 'round clean-up tool. And look at these features . . . choice of two-way angling with hydraulic drive and control or one-way mechanical drive; EXCLUSIVE swing arrangement on two-way angling models keeps sweeping path *centered* ahead of tractor; brooms with 32″ diameter, 60″ and 72″ lengths; sweep 4 ft. or 5 ft. path. ▪ Act now! Snowtime is just around the corner . . . see your tractor dealer.

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NEW HOLSTEIN, WIS.

MANUFACTURERS OF QUALITY MUNICIPAL AND CONSTRUCTION EQUIPMENT since 1907

To order these helpful booklets check the reply card opposite page 36.

NEW LISTINGS (Cont.)

Incinerators for the Disposal of Combustible Wastes

616. Bulletin 179 from the Morse Boulger Destructor Company, New York 17, N. Y. describes fully the basic principles of incineration as to combustion, auxiliary burners, draft and control and elimination of fly ash. Specifications and design of incinerators and hopper doors are included.

Safti-Design Hi-Way Rotary Mower

619. A rotary mower that mows a full 60-inch swath and has the exclusive safti-design is described in catalog available from Sunflower Industries, Inc., Olathe, Kansas. Complete specifications on this mower and other information can be had by checking the handy reply card.

All Welded, Field Erected Steel Storage Tanks

625. Tank sizes and tank charts for design and erection of storage tanks are fully covered in bulletin available from Fisher Tank Co., Chester, Pa. Check the reply card for information on welding, testing and maintenance of these tanks.

Engineered Electrical Systems for Sewage Treatment Plants

634. General Electric equipment can help you achieve efficient, economical sewage plant operation. Write to G-E Apparatus Sales Office, General Electric Co., Schenectady 5, N. Y., for complete coverage of these electrical systems or check the reply card.

Vertical Augers and Horizontal Diggers For Construction Work

644. Prewitt diggers are 2 types, a horizontal boring machine for tunneling work and a vertical rig for pole or post holes, digging up to 6½ ft. Check the reply card or write to J. R. Prewitt and Sons, Inc., Dept. 508, Pleasant Hill, Mo., for full details.

Tool Used by Highway Engineers in Soils Surveys

646. The Vibroground is used to determine type, location, depth and extent of various soils and rock formations. Check the reply card or write Associated Research, Inc., 3777 West Belmont Ave., Chicago 18, Ill., for complete details on this geophysical resistivity survey instrument.

Prestressed Concrete in Your Construction Needs

647. Prestressed beams, slabs and girders for bridges are covered in information available from American Steel & Wire, Rockefeller Bldg., Cleveland 13, Ohio. Check the reply card for complete details.

Better Roads With Sterling Rock Salt

650. This manual describes the simplified 7-step method of road improvement with rock salt. This type of salt stabilization is designed for cities, townships and counties. Check the reply card or write Highway Sales Dept., International Salt Co., Scranton, Pa., today.

Complete Sewage Treatment Plant

653. Plants for smaller populated areas that can be easily and quickly installed are covered in literature from Municipal Service Co., Contracting Engineers, 4625 Roanoke Parkways, Kansas City, Mo. Check the reply card for plant design data.

Choosing the Right Size Tractor for the Job

655. An 8-page Bulletin D837 that explains how matched tools boost production by adjusting each tractor to the specific job is available from the Advertising Div., Caterpillar Tractor Co., Peoria, Ill. Also the methods for selecting used equipment are discussed. Check the reply card.

Color Catalog Describes "Michigan" Tractor Dozers

666. A 20-page catalog on "Michigan" Models 180, 280 and 380 tractor dozers covers the design and operating features and explains how the hydraulic controls regulate all dozer operations. For your copy write to Construction Machinery Div., Clark Equipment Co., P. O. Box 599, Benton Harbor, Mich., or check the reply card.

Turn Your Water Meter Reading Inside-Out

671. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

Catalog of Metal Laboratory Equipment

674. This 180 page Catalog 5-B contains complete information on Metalab's expanded line of metal laboratory equipment. It is divided by groups of equipment as follows: center tables, wall tables, desks, titration tables, sinks and drainboard units and accompanying fixtures and accessories. For your copy write to Metalab Equipment Co., Div. of Norbute Corp., 214 Duffy Ave., Hicksville, L. I., N. Y., or check the reply card.

Aluminum for Complete Line of Signs and Sign Blanks

675. Valuable information on aluminum's advantages, features and economies, plus details on application of all sign message materials are covered in the aluminum sign bulletin from Kaiser Aluminum & Chemical Sales, Inc., Dept. MU-936, 919 N. Michigan Ave., Chicago 11, Ill. Check the reply card today.

Electronic Locators for Water Mains, Services, Valves and Boxes

677. Miniaturized line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours is described in literature from Wilkinson Products Co., 3987 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

•

WATER WORKS

Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 66-page Catalog 905 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP 56-1 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 50 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80 Ill., or check the reply card.

Plastic Wash Troughs For Water Treatment

45. Leopold fiberglass-reinforced plastic wash troughs for water treatment are described in literature from F. B. Leopold Co., Zelienople, Pa. Check the reply card for data on these units that will last for years without any painting or other maintenance.

Meter Features That Help Make Water Works Profitable

39. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

ALABAMA
G. C. Phillips Tractor Company, Inc., Birmingham
Prichard
ALASKA (See Washington)
ARIZONA Equipment Sales Company, Phoenix
ARKANSAS
Clark Equipment Company, Inc., Little Rock
CALIFORNIA
Brown-Bevis Industrial Equip. Co., Los Angeles
Standard Machinery Company, San Francisco
COLORADO
H. W. Moore Equipment Co., Denver, Grand Junction
CONNECTICUT
Eastern Equipment Sales, Inc., West Haven
DELAWARE
Ransome Corporation, Bear
FLORIDA
Square Deal Mach. & Sup. Co., Inc., Orlando
Square Deal Machinery of Miami, Inc., Miami
Square Deal Machinery, Inc., Jacksonville
GEORGIA Stith Equipment Company, Atlanta
IDAHO Feenaughty Machinery Company, Boise
ILLINOIS
Illinois Contractors' Machinery, Inc., Elmhurst
Peoria
INDIANA
Reid-Holcomb Company, Inc., Indianapolis
IOWA Vivian Equipment Company, Ames
Wendler-Kraus Equip. Co., Inc., Cedar Rapids
KENTUCKY
Williams Tractor Company, Louisville
LOUISIANA
General Equipment, Inc., Baton Rouge
MAINE
Eastern Tractor & Equipment Co., Portland
MASSACHUSETTS
Perkins Machinery Co., Inc., Needham Heights, Springfield
MICHIGAN
Earle Equipment Company, Detroit, Grand Rapids
MINNESOTA
William H. Ziegler Co., Inc., Minneapolis, Hibbing, Crookston, Duluth
MISSISSIPPI Equipment, Inc., Jackson
MISSOURI
Koste Machinery Company, Inc., Robertson
G. W. Van Keppel Company, Kansas City
MONTANA
Pioneer Equipment & Supply Company, Butte
H-C-L Equipment, Inc., Billings, Great Falls
NEBRASKA
Missouri Valley Machinery Co., Omaha
Nebraska Machinery Company, North Platte
NEVADA Sierra Industrial Company, Inc., Reno
NEW HAMPSHIRE
Mingolla Machinery Company, Concord
NEW JERSEY Dale & Rankin, Inc., Hanover
NEW MEXICO
N. C. Ribble Company, Albuquerque
NEW YORK
J. C. Georg Construction Equip. Co., Syracuse, Schenectady, Lisbon
P-D Service, Inc., Pavilion, Buffalo
H. O. Penn Machinery Company, Inc., New York, Poughkeepsie, Westbury, Long Island
NORTH CAROLINA
H. B. Owsley & Son, Inc., Charlotte
NORTH DAKOTA
Northwestern Equipment, Inc., Fargo, Minot
OHIO
Rish Equipment Company, Cincinnati, Cleveland, Columbus, Dayton, Portsmouth, Toledo, Youngstown
OKLAHOMA
Leland Equipment Co., Tulsa, Oklahoma City
OREGON
Feenaughty Machinery Company, Portland
PENNSYLVANIA
Watson Equipment, Inc., Pittsburgh
Ransome Corporation, Philadelphia
SOUTH CAROLINA
Ray Long Equipment Inc., Columbia, Greenville
SOUTH DAKOTA Sioux Road, Inc., Sioux Falls
TENNESSEE
Tri-State Equipment Company, Memphis
Power Equipment Co., Chattanooga, Kingsport, Knoxville
TEXAS
J. W. Bartholow Machinery Company, Dallas
Conley-Lott Machinery Company, Lubbock
Equipment Supply Company, Inc., El Paso
UTAH
Rocky Mountain Machinery Co., Salt Lake City
VERMONT Mingolla Machinery Company, Barre
VIRGINIA
Rish Equipment Company, Richmond, Roanoke
WASHINGTON
The Carrington Company, Seattle
Feenaughty Machinery Co., Seattle, Spokane
WEST VIRGINIA
Rish Equipment Co., Bluefield, Charleston, Clarksburg, Parkersburg
WISCONSIN
Drott Tractor Company, Inc., Milwaukee
WYOMING
Wortham Machinery Company, Cheyenne
HAWAII
Edward R. Bacon Co. of Hawaii, Ltd., Honolulu

There's a HI-WAY Ice Control Spreader to Fit Every Specification

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HIGHWAY EQUIPMENT COMPANY
604 D. Ave. N. W. **Cedar Rapids, Iowa**

To order these helpful booklets check the reply card opposite page 36.

Valuable Bulletin on Rodney Hunt Sluice Gate

61. Sluice gate seats on a resilient rubber seal flush with the bottom of the channel and eliminates bottom wedges and the trough in which they descend. Gives design flexibility in water filtration, sewage treatment and sluices, dam, channel and chamber flow control. For complete details write to Rodney Hunt Machine Co., 82 Lake Street, Orange, Mass. for Bulletin 75, or check the reply card.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Valve and Hydrant Construction Details

161. A 72-page catalog-type bulletin, just completed, gives detailed data on construction and application of gate valves, check valves and hydrants for water works service. Write for Bulletin 5710 from Darling Valve and Mfg. Co., Williamsport, Pa., or check the reply card.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or write The Preload Co., Inc., 21 East 37th St., New York 16, N. Y.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Bulletin on Submersible Booster Pump

201. Typical installations, description of unit, standard models, selection tables and the many jobs where this pump can be used are fully described in the bulletin. For full details write Layne & Bowler Pump Co., 2943 Vail Ave., Los Angeles 22, Calif., or check the handy reply card today.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Catalog on Dewatering Pumps

226. Centrifugal and diaphragm pumps for dewatering jobs are described in Catalog DP7 from The Jaeger Machine Co., 550 West Spring St., Columbus 16, O. Models, specifications and performance tables are included. Check the reply card.

Foxboro Magnetic Flow Meter

238. The Foxboro magnetic flow meter measures water and wastes electrically, without any line restriction. No loss of head, no fouling, even with slurries. For detailed illustrated Bulletin 20-14B check the reply card or write The Foxboro Co., Foxboro, Mass.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

New manganese steel tines cut grapple maintenance UP TO 25%!

The new Blaw-Knox TI-150 (1½ cubic yard) and TI-250 (2½ cubic yard) incinerator grapples are designed to slash tine maintenance costs, and losses due to failure of retaining arrangements.

Equipped with Hadfield 12-14 per cent Manganese steel tines, these new grapples give added resistance to abrasiveness. In addition, the tines are designed to resist breakage experienced in incinerator operation.

A new retaining arrangement features a completely enclosed top key, and the bottom key placement gives added protection against blows. All tines are held in such way as to prevent accidental shearing.

Get full details and other helpful information which will improve your operation from your Blaw-Knox Bucket engineer.

New TI-250 (2½ cubic yard) grapple equipped with manganese steel tines in daily service.

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Pittsburgh 38, Pennsylvania

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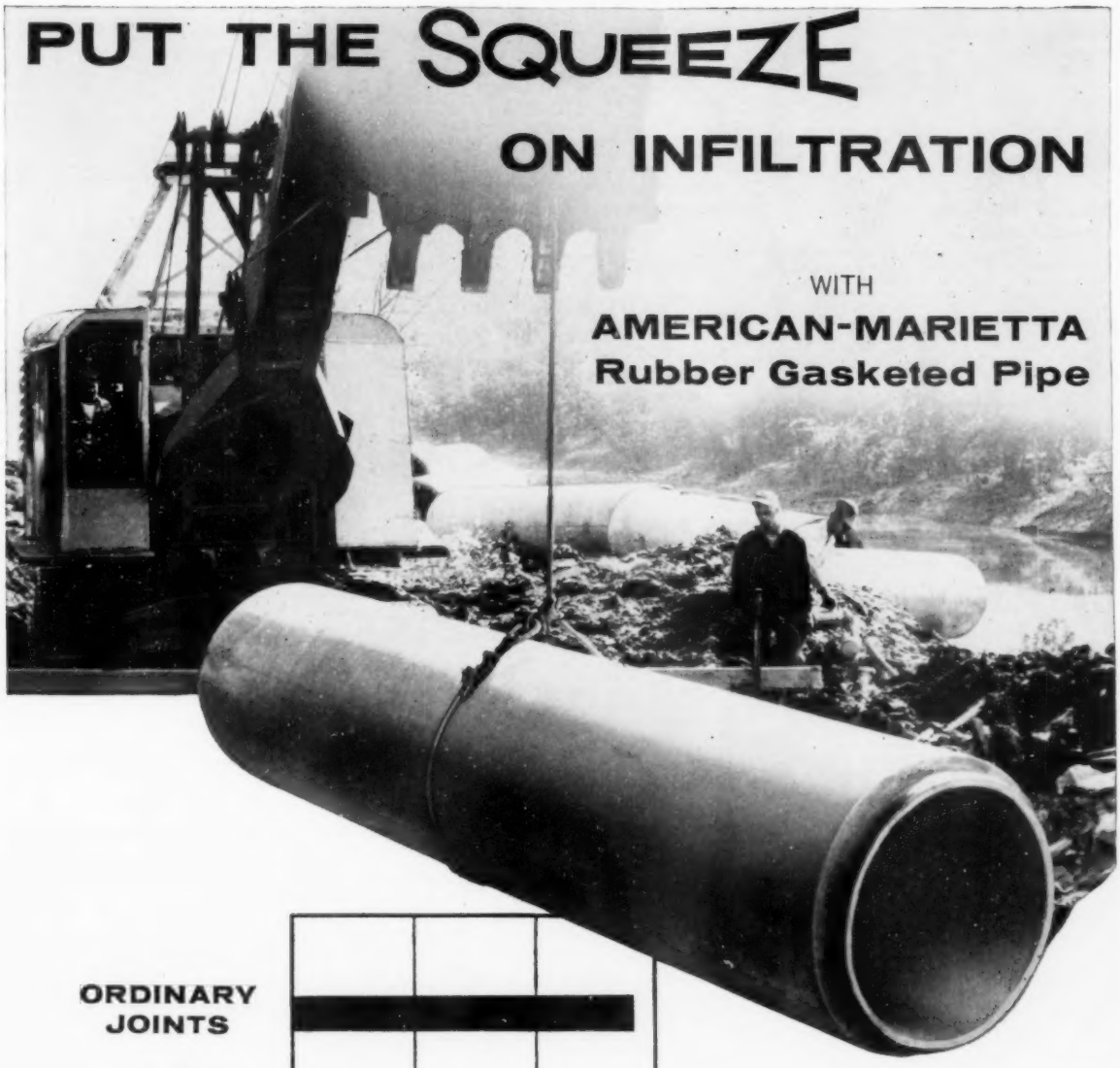

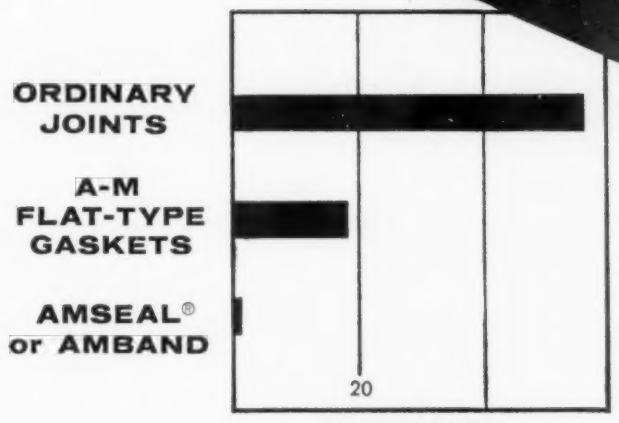

American-Marietta flat-type gaskets and longer length pipe reduce leakage and provide savings through faster installation with fewer joints.

For positive control of infiltration specify AMSEAL (Rubber and Steel Joints) or AMBAND (Fiberglass-Resin-Collar Joints).

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101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600

To order these helpful booklets check the reply card opposite page 36.

Outline of Modern Water Treatment Equipment

248. Bulletin 4433 is recommended for engineers who need a basic refresher course on treatment of municipal and industrial water. It lists water impurities and methods of treatment and illustrates treatment systems and equipment. Check the reply card or write The Permutit Co., a Division of Pfaudler-Permutit Inc., 50 West 44th St., New York 36, N. Y., for your copy.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Department, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin BW-13 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Renew Pipe Performance With Cement Mortar Lining

322. Application of the Tate and Spunline process for cement mortar lining of existing pipe lines with a minimum of interruption of service is described, with diagrams, photographs and specifications in Catalog 15-58. Write to Pipe Linings, Div. of American Pipe and Construction Co., P. O. Box 457, Wilmington, Calif., or check the reply card.

Automatic Drilling Machine For Cutting Any Type of Pipe

325. The CL-12 drilling machine may be hand or power operated and will make cuts from 2 to 12 inches through any type of pipe. Check the reply card for full details or write the Mueller Co., Decatur, Ill.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are 5/8"-5/8"x3/4"-3/4" and 1". Check the reply card.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Engineering Data on Equipment for Municipal Water Conditioning

347. For information on the design and operation of many types of water treatment plant equipment, including the Graver Reactivator, pressure filters, iron removal installations, zeolite softening and water conditioning for swimming pools get Bulletin WC-113 from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Check the reply card.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

V-Notch Chlorinator For Chlorine Flow Control

502. An 8-page catalog on the W & T Series A-721 chlorinator is available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Chlorinator is adaptable to any type of chlorinator control and feed rate may be controlled manually or automatically.

Bulletin Helps Specify A.W.W.A., Gate Valves

547. Double disc gate valves in 2" to 60" sizes are fully described in a 16-page bulletin which gives details on valve parts, design, materials, application of the "O" Ring Seal, operation and operating devices, directions for ordering valves and parts, dimensions of all sizes, and descriptions of eleven different methods for end connections. Valves for horizontal operation, square bottom valves, many types of gearing and gear cases, and a complete listing of special controls available are included. Get Bulletin A from Rensselaer Valve Co., Troy, N. Y. by checking the reply card.

Use The Reply Card

Modern Elevated Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered.

Air Control Valves For All Types of Pipelines

620. Literature on Crispin Air Valves, which safely control air in lines handling liquids, to maintain efficient operation and prevent expensive failures, is available from Multiplex Manufacturing Company, Dept. C, Berwick, Pa. Write today for your copy of the Crispin Air Valve Catalog, which offers complete information on the full line of dependable Crispin Air Valves.

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To order these helpful booklets check the reply card opposite page 36.

Slide Rule For Chemical Feed Calculations

627. A very handy chemical feed calculator is available from Industrial Chemical Sales Division, West Virginia Pulp and Paper Co., 230 Park Ave., New York 17, N. Y. Pounds per million gallons, grains per gallon and grains per gallon of CaO from lime are several of the calculations that can be made. Check the reply card today.

Water Tanks, Reservoirs and Standpipes

631. Data on steel water tanks, reservoirs and standpipes of all capacities are included in literature available from Graver Tank & Mfg. Co., Inc., East Chicago, Ind. These units are fabricated and erected by the company. Check the reply card.

Tyton Joint For Water

779. McWane Tyton joint and mechanical joint cast iron pipe are described in catalog from McWane Cast Iron Pipe Co., Birmingham 2, Ala. Check the reply card for details on pipe from 2 through 12 ins.

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N.J. Check the reply card and we will forward your request.

Flash Drying and Incineration System

36. Bulletin FD-57 outlines the problem of sewage sludge disposal and includes color diagrams and photographs that explain how the C-E Raymond System works in heat drying and incineration. Check the reply card or write Combustion Engineering, Inc., Raymond Div., 1319 North Branch St., Chicago, Ill., for full details.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Selection and Application Handbook on Comminutors

79. Included in this handbook is a description of Worthington's comminutor line covering its features, dimensions and other information necessary for correct selection and application. Check the reply card or write Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N. J., for Handbook #W-317-B17AP.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit, Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Buckets and Grapples For Incinerator Service

110. Bulletin provides comprehensive information on the 5 sizes of 2-line, lever arm, clamshell-type buckets; standard 2-line, tine-type grapples; equalizer arrangements and certain incinerator buckets for single drum hoists. Check the reply card or write Blaw-Knox Co., 300 Sixth Ave., Pittsburgh, Pa., today.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long tasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

A Short Course In Pipe Jointing

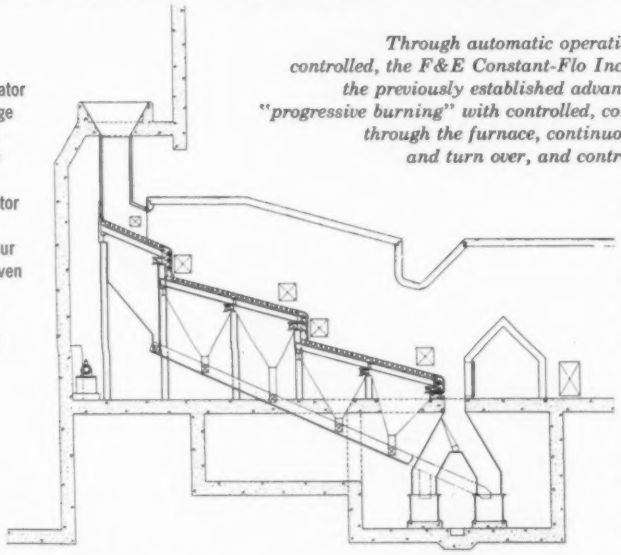
169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card.

F&E Constant-Flo Incinerator Stoker

Companion Stoker—F&E Standard Incinerator Stoker

In addition to the F&E Standard Incinerator Stoker for batch charge plants, the Flynn and Emrich Company now offers the F&E Constant-Flo Incinerator Stoker . . . using the latest application of our already tried and proven F&E Incinerator Stokers . . . for those municipalities calling for "Constant-Flo" operation.

Through automatic operation, electronically controlled, the F&E Constant-Flo Incinerator Stoker combines the previously established advantages of F&E "progressive burning" with controlled, constant flow of material through the furnace, continuous agitation, break up and turn over, and controlled residue disposal.



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VERTICAL STABILIZERS—Individually controlled, non-slip stabilizer feet let you level-up and hold on slopes, tilt for bell holes. Vertical thrust eliminates excessive cylinder pressure. Note how operator revolves with the boom!

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Davis has unobstructed visibility so you can work fast and accurately in tight situations without having to "feel" your way around the job, nor depend upon shouts and hand signals for instructions. Both the big comfortable seat and finger-tip controls swing with the boom. You **always** face your work!

Advanced engineering and top quality construction? ***Yes!, but you will find them priced competitively low!***

Davis Loaders and Backhoes are available for all popular models of International, Ford, Fordson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, Minneapolis-Moline, and Work Bull Tractors.

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To order these helpful booklets check the reply card opposite page 36.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the reply card or write to the manufacturer and ask for Bulletin TR-94A.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check reply card for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Md.

Dependable Engines for Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Division, Waukesha Motor Co., Box 379, Waukesha, Wisc.

Pneumatic Sewage Ejector Pumping Systems for Low Flows

317. Dimension and capacity tables for pneumatic float or electrode controlled ejectors, cast iron or welded steel, covering flow ranges of 20 to 600 gpm, including all information necessary in design are given in Bulletin No. KSM-2 3/58. Check the reply card or write Komline-Sanderson Engineering Corp., 101 Holland Avenue, Peapack, N. J.

Waste Receptacle Designed For Efficient and Economical Sanitation

345. This waste receptacle is readily attached to any post or wall and can be used in streets, parks and public buildings. Check the reply card or write Vega Industries, Inc., Syracuse 5, N. Y., for complete literature.

Engineering Data Manual on Underground Lift Stations

218. This 100 page manual includes descriptive bulletins, specifications covering typical installations for pump type or ejector type stations, friction loss tables covering capacities and size of pipe, pump and motor selection charts and wiring diagrams. Check the reply card or write Smith & Loveless, Inc., Water and Sewage Equipment, P. O. Box 8884, Kansas City, Mo.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehensive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading.

Vitrified Clay Floor System For Trickling Filters

452. The IMCO two unit floor is noted for its mechanical strength, simplicity of construction and large percentage openings for aeration. The units are self spacing and easily set in place. Check the reply card or write Industrial Materials Co., Somerset St. and Trenton Ave., Philadelphia 34, Pa., for complete catalog.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135 describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

Grit Collecting And Grit Washing Equipment

580. This 28-page book on grit collecting and grit washing equipment is profusely illustrated and contains data on 7 types of grit collectors, 2 grit washers and the Tritor screen. Detailed drawings and specifications are included to assist the engineer in the preparation of drawings. For your copy of Book 2571 check the reply card or write the Link-Belt Co., Colmar, Penn.

Press-Seal Rubber Gaskets to Seal Joints of Concrete Pipe Sewers

623. Rubber gaskets for sealing the joints of concrete sewer pipe are described fully in literature available from Press-Seal Corp., P. O. Box 482, Fort Wayne, Ind. Check the reply card for information on how these gaskets prevent water infiltration in sewer lines.

Application and Design of Prefabricated Pumping Stations

637. This manual is intended for a guide in designing sewage pumping stations and in explaining the use of prefabricated underground sewage pumping stations. Check the reply card or write to Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill., for your copy.

Reinforced Concrete Pipe For Culverts and Sewers

672. Elliptical Lo-Hed and Hi-Hed pipes, round pipe and flat base pipe are described fully in literature from American-Marietta Co., Concrete Products Div., 101 East Ontario St., Chicago 11, Ill. Headwall details, discharge curves, hydraulic capacity tables and hydraulic properties are included. Check the reply card.

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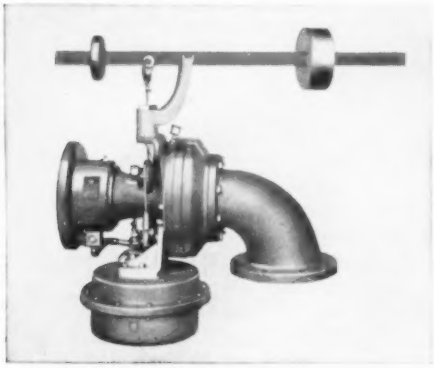
Direct venturi-actuated. Self-contained . . . operates when all power sources fail.



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Send me new Technical Bulletin 900 that gives valuable design and performance data on Filter Controllers and Master Control Systems.

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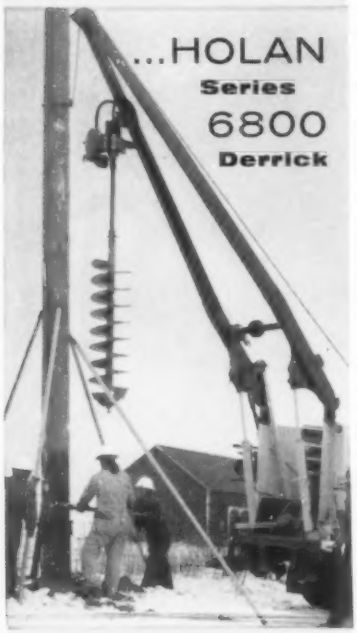
the derrick that lifts more in the low ranges



Here's the two-legged derrick that gained immediate acceptance with utilities. It handles 8,000 pounds . . . 2,000 pounds when only 5½ feet from the ground. Sets 65-foot poles and body-loads 4,000 pounds. Live-boom action with a single-drum winch. Lighter-but-stronger fabricated rectangular side legs. Write for technical brochure.

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Company_____

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CONSTRUCTION EQUIPMENT AND MATERIALS

Tractor Loader Can Be Converted Into Eight Different Machines

38. Multiple-purpose tractor loader can be converted to a street sweeper, backhoe, fork lift, angle dozer, crane and rotary broom in a short time. Check the reply card or write Massey-Ferguson Industrial Div., 1009 South West St., Wichita 13N, Kans., for well illustrated catalog.

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air-placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the reply card today.

Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer.

Manual on Coatings to Stop Rust

235. Primer type, short oil type, heat resistant, chemical resistant and floor coatings are a few of the items covered. Also complete data on Rust-Oleum products are included. Check the reply card or write Rust-Oleum Corp., Evanston, Ill., for this valuable manual.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your buildings needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co., Kansas City, Mo.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 108-page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

Concrete Cutting Machine

454. A concrete cutter that has a front alignment pointer, hinged blade guard, 18 hp engine, right or left hand operation and control, uniform depth of cut is described in literature from Felker Mfg. Co., Torrance, Calif. Check the reply card.

Heavy Duty Air Cooled Engines For Many Uses

223. Power and weight specifications, dimensions and uses are fully covered in literature issued by Wisconsin Motors Corp., Milwaukee 46, Wis., on their air-cooled engines. Also available is a service map and a list of their distributors and approved service stations.

Advanced Tractor Design Gives Better Performance

399. The Ford Tractor offers 4-wheel stability, built-in hydraulic system, power take-off, as well as greater power, performance and economy. A complete booklet describes five tractor models in two power series, showing the latest in advanced tractor design and including many applications of equipment for saving time and money. For your copy check the reply card or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

Principles of "BatchOmatic" Plants Explained

527. The unique principles of simultaneous and fully automatic aggregate and bitumen measuring followed on Barber-Greene's 2,000, 4,000 and 6,000 lb. "BatchOmatic" bituminous batch plants are explained with cut away drawings, charts and other illustrations in a 3-color bulletin offered by Barber-Greene Co., Aurora, Ill. Check the reply card.

A Completely Hydraulic Ladder

610. This completely hydraulic ladder is described in a new catalog published by J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Detailed drawing of the pedestals, throttle control and ladder construction are included.

Most Complete Line of Portable Rotary Compressors

698. The Ingersoll-Rand Gyro-Flo is available in 6 sizes—85, 125, 210, 315, 600 and 900 cfm. Write Ingersoll-Rand, 11 Broadway, New York 4, N. Y., or check the reply card for information on these advanced-design rotary compressors.

STREET LIGHTING AND TRAFFIC CONTROL

Safety and Efficiency With 3-Way Traffic Control

63. El-Tec radio interconnection enables cities to have complete traffic control in traffic programming, control originating with emergency vehicles and Civil Defense evacuation control. Check the reply card or write Electronic Protection Inc., 2085 North Hawthorne Ave., Melrose Park, Ill., for complete literature.

Highway Lighting Engineering Guide

207. This catalog is primarily aimed at the new highway lighting program that is being undertaken nationally. It gives data on the quantity of light required; lighting on main traffic lanes, interchanges, intersections, toll plazas and bridges. It also covers information on the relative cost of lighting and the selecting of the light source. Write to Westinghouse Electric Corp., Lighting Div., 1216 West 58th St., P. O. Drawer 5817, Cleveland, Ohio.

Engineering Data on Aluminum Lighting Standards

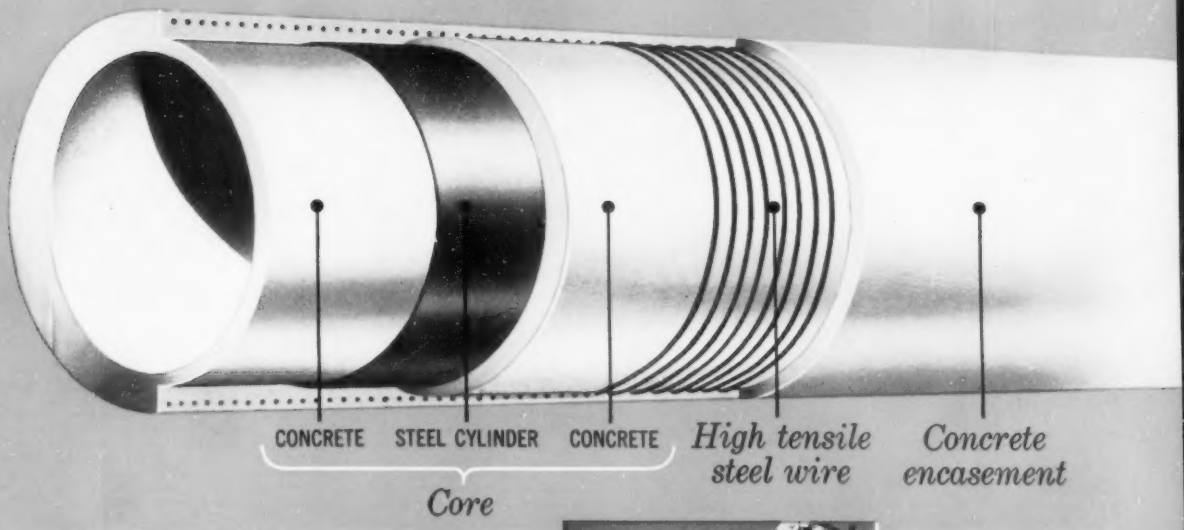
256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St., Newark, N. J.

Monotube Poles For Highway Lighting and Signing

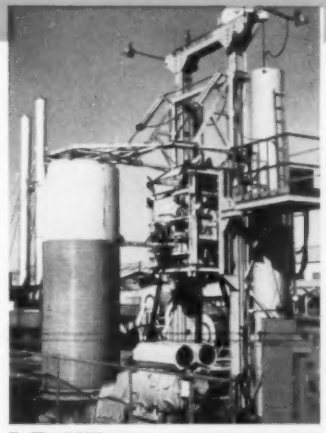
509. This 24-page Catalog LS-23, describes steel and aluminum highway poles, overhead sign mountings and base and bracket details and is available from The Union Metal Mfg. Co., Canton 5, Ohio. Check the reply card today.

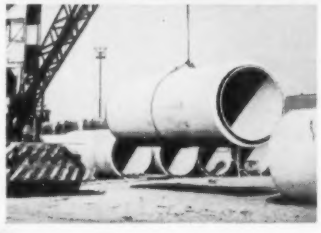
PRESTRESSED
CONCRETE CYLINDER PIPE
(Embedded Cylinder Type)

with Rubber Gasket Joint



All of the good qualities and characteristics desired by water works engineers for permanent water supply and transmission lines are embodied in this prestressed pipe of advanced design: great strength, sustained high carrying capacity, trouble-free service, and unusually long life. Prestressed pipe of this type can be designed more accurately, predictably and economically for most all conditions of internal pressure and external loads than any other type of high quality concrete pressure pipe. It is the finest quality pipe available in medium and large diameters for pressures generally ranging from 100 psi upward. American is currently undertaking the manufacture of this pipe designed for pressures ranging from 275 to 550 ft. of head for a portion of the U.S. Bureau of Reclamation Project being constructed for the Ventura River Municipal Water District. This Ventura River Project will serve 32 square miles of mountainous country with water for irrigation, municipal and industrial use in main and coastal reaches of Ventura County, California. When planning *your* future water "growth lines," look to American's quality pipe line products, extensive production facilities and half century of experience.





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CONCRETE PIPE FOR MAIN WATER SUPPLY LINES, STORM AND SANITARY SEWERS, SUBAQUEOUS LINES

To order these helpful booklets check the reply card opposite page 36.

STREETS AND HIGHWAYS

Get Full Data On Aggregate Spreaders

34. Accurate control for spreading asphalt, crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on towed, truck mounted and tailgate types available by checking the reply card. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

Highway Signs Made of Fir Plywood

40. Specification and procurement, design data, case histories and reference data of fir plywood signs are the sections covered in this file of Bulletins available from the Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card.

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

Inexpensive Ditcher Handles Heavy Diggings

91. The Shawnee Scout Ditcher, a heavier model for extensive digging, has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas

Complete Line of Premolded Expansion Joint Fillers

140. Expansion joint fillers for use in expansion joints in concrete are described in literature from Servicised Products Corp., 6051 West 65th St., Chicago 38, Ill. Check the reply card.

Sidecrane-Backfiller-Tamper, A Versatile 3-Way Machine

125. A 3-way machine, the Cleveland 80W, that is a backfiller, sidecrane and tamper is described fully in a 12-page Bulletin, No. L-102, available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Design and construction features, photographs of the machine in operation and complete dimensions and specifications are covered. Check the reply card.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

Portable Hot Asphalt Paving Repair Unit

250. Maximum economy in paving repair and maintenance is claimed for the compact "Patchmobile" which has a rotary tube continuous dryer, batching hopper for accurate proportioning, twin hot asphalt tanks, heat jacketed pugmill, tool heaters and hand spray bar. Get latest data from Wylie Mfg. Co., 5926 N. W. 39th St., Oklahoma City 12, Okla. Use the reply card.

3-Wheel Roller With Vibratory Compactor

252. Bulletin 423 shows how to get the static compressing action of massive roller weight plus the consolidating action of vibration with one machine. Write The Galion Iron Works & Mfg. Co., Galion, Ohio, or check the reply card for construction features and complete compression tables.

Why and How To Use Pneumatic Tired Rollers

290. The why and how of pneumatic tired rollers on base and surface courses, sealing completed fills, surface treatments, floated surfaces, hot and cold asphalts and stabilized soils are covered in Bulletin 10 from Tampo Mfg. Co., San Antonio, Tex. For information on operating conditions and compaction charts check the reply card.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Valuable Data on Oliver OC-18 Diesel Crawler

342. Specifications, operation and maintenance data and optional equipment are covered in bulletin from The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio. Check the reply card for full details.

Specs For Aluminum Increment Sheet Highway Traffic Signs

377. Installation procedures, bid specifications and general information on aluminum traffic signs are covered in Bulletin 58 R from Traffic and Street Sign Co., 84 Foundry St., Newark 5, N. J. Check the reply card for data on methods of erection, wind loadings and other details.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Division of Warner & Swasey Co., Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

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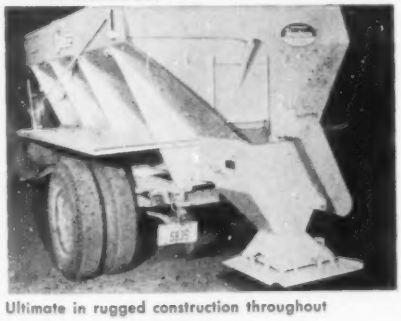

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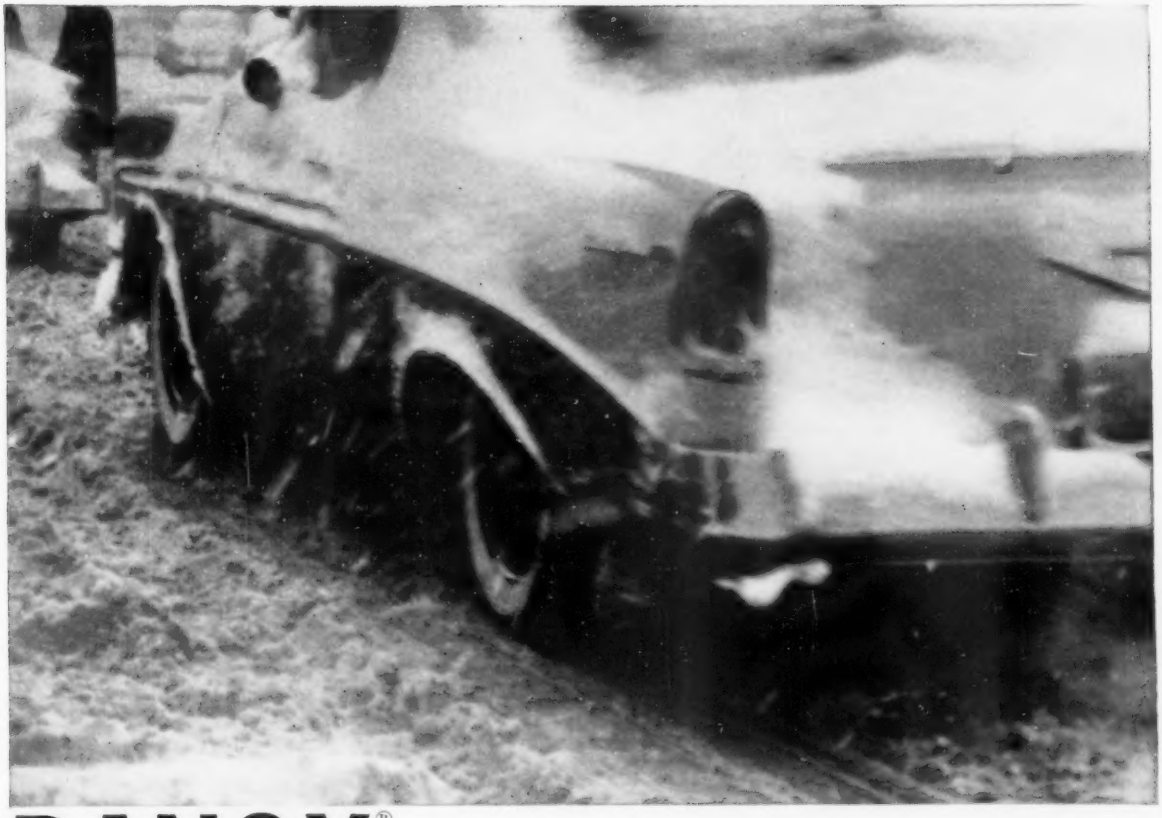

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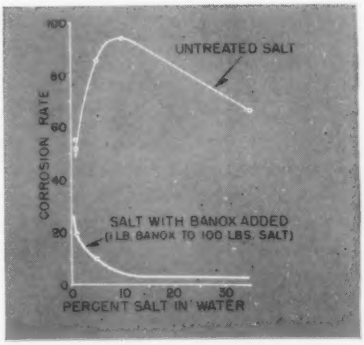

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CUTS PUMPING COSTS

LESS SPACE
Verti-Line pumps occupy as little as 1/5 the space of ordinary horizontal pumps of similar capacity.

GREATER EFFICIENCY
Pumping efficiencies ranging to 90% mean you get maximum output with minimum power input.

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Operating overhead is cut because submerged pumping element eliminates priming.

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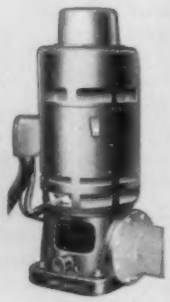
Verti-Line pumps range from 20 to 35,000 gpm, 1½ to 1000 H.P., and handle both corrosive and non-corrosive fluids.
Write for Bulletin U-98



Verti-Line Pumps are exclusive products of

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Information on Trucks for Every Job

442. Literature on the complete IHC truck line is available from International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Included is information on basic models, conventional and COE, 4-wheel, 6-wheel and four-wheel-drive. Check the reply card.

Hydraulic Backhoe For Many Makes of Tractors

456. A backhoe that digs sewer systems, culverts, water mains, foundations and ditches is described fully in literature from Henry Mfg. Co., Inc., 1700 N. Clay St., Topeka, Kans. Check the reply card for specifications and details.

Ottawa Truck-Mounted Backhoe For Chevrolet Trucks

486. Designed for complete mobility as well as digging ability, the unit travels at regular truck speeds and digs 12½ ft. deep in any position of a 190° arc. Check the reply card, or write Ottawa Steel Div. Young Spring and Wire Corp., Ottawa, Kansas.

IHC Crawler Tractors For Highway Construction

491. Information on the new International TD-6, TD-9, TD-14 and TD-18 diesel crawler tractors is contained in 8-page, 2-color booklets available from Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Mechanical features and specifications, engine power, and operation are fully covered.

Complete Line of Road Rollers and Compaction Equipment

520. Buffalo-Springfield's complete line of road rollers and compaction equipment is described in a 12-page illustrated Buletin No. S-73-157 just released by Buffalo-Springfield Roller Co., Division of Koehring Co., Springfield, Ohio. Check the reply card for on-the-job pictures, as well as construction details of the 2-axle tandems, 3-axle tandem, 3-wheel rollers and the K-45 Kompactor.

Complete Line of Asphalt Patching Mixers

586. Mixers capable of mixing 3 to 20 tons of hot mix per hour are described in literature available from McConnaughay Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

Complete Line of Earth Boring Machines

591. A 16-page illustrated catalog on the Hydrauger line of boring machines has been released. Field operation photos and views showing embankment drainage and pipe line installation are included in this material available from Hydrauger Corp., Ltd., 681 Market St., San Francisco, Calif.

What You Should Know About a Motor Grader

673. Photographs, sketches and other instruction illustrations aid readers to visualize details of the Allis-Chalmers Model Forty-Five motor grader mechanical features and components. The catalog also tells about attachments and accessories. Write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc.

Literature on Reflective Glass Beads

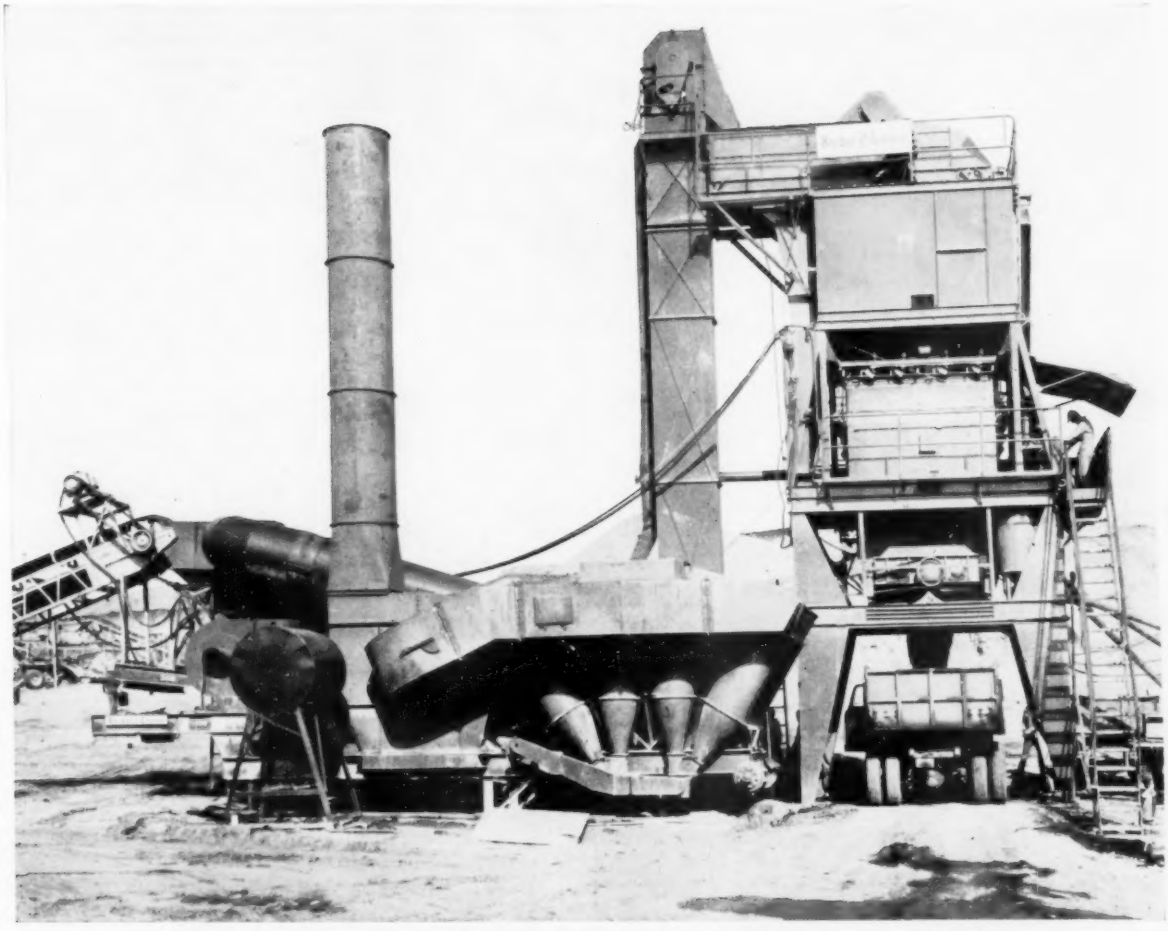
690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card.

Slide Rule PS1 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.

Axles For Construction and Maintenance Trucks

767. Eaton 2-speed axles cut operating and maintenance costs in trucks. They provide easy shift, supply positive lubrication and have a self-contained air brake. Check the reply card or write Eaton Mfg. Co., Axle Div., Cleveland, Ohio.



San Ore Construction Company's 6000-pound Barber-Greene Model 896 BatchOmatic, which has been set up at four widely scattered job-sites. Write for your copy of clearly illustrated *Principles of the BatchOmatic.*

Fast, low-cost moving... another BatchOmatic advantage

In its relatively short life this 6000-pound Barber-Greene BatchOmatic has worked on four widely scattered paving jobs. The fact that San Ore Construction Company could move this plant over the highway for these jobs is proof of the superior portability of the BatchOmatic.

The plant was initially set up at Caldwell, Kansas, where it produced mix for Sections 1 and 2 of the Kansas Turnpike. It was then moved about 200 miles to Ellsworth, Kansas, for another road project. The next and longest hop was about 500 miles to Fairplay, Colorado, for paving the upstream face of Montgomery Dam, a job that totaled only 20,000 tons. Its final move of the season was about 100 miles to Fountain, Colorado, for a highway resurfacing project.

Besides their unmatched portability, Barber-Greene BatchOmatics offer:

- Simultaneous measuring of all sizes of aggregate.
- Instant changeover from automatic to manual operation, and from manual to automatic.
- New Dyna-Mix Pugmill which gives thorough coating in less time than any other pugmill.
- Instant, positive inspection of aggregate gradation and weight.

Write for information on the world's most modern asphalt paving equipment. 58-3-AL

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

To order these helpful booklets check the reply card opposite page 36.

Sweepers Handle A Variety of Jobs In Every Season

684. Mechanical drive one-way and pull type 2-way sweepers and hydraulic 2-way sweepers that are tractor-mounted or loader-mounted are fully covered in literature from M-B Corp., 1611 Wisconsin Ave., New Holstein, Wisc. Jobs like cleaning dust, dirt and snow from streets and highways and sweeping park lawns are a few of the sweepers applications. Check the reply card.

Catalog on All Phases of Brush Disposal

771. This informative 2-color catalog gives complete detailed information on Fitchburg Chippers, and includes drawings, specifications, diagrams and charts. Check the reply card or write Fitchburg Engineering Corp., Fitchburg, Mass., today.

●

WEED AND DUST CONTROL

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

Weeds Controlled by Using Simazin 50W

318. General weed control is accomplished by using Simazin 50W and water. For full information on this new pre-emergence herbicide and how to use it write Gaigy Agricultural Chemicals, P. O. Box 430, Yonkers, New York. Check the reply card.

●

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, New York.

Catalog on Equipment For Ice and Snow Control

410. Information on Baker snowplows and Flink ice control spreaders is available from The Flink Co, Dept. 5613, Streator, Illinois. Fully covered are reversible and one-way plows with hydraulic power lifts to meet every specification and single or dual spinner type spreaders. For reference catalog #110 check the reply card.

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

Full Line of Weapons for Snow and Ice Battles

268. Whether your snow problems are heavy or light, you'll find equipment for virtually all your needs among the plows and spreaders offered by Good Roads Machinery Corp., Minerva, Ohio. The "Champion Line" of Vee plows and one way and reversible plows with safety blade trip will handle snow removal; for chlorides and abrasives spreading there are five "Jet Line" spreader models and the 4-U towed spreader.

Complete Ice and Snow Fighting Equipment

523. Snow plows in 55 models and 9 types, material spreaders with width of spread of 8 to 20 ft. and hopper capacity of 2 cu. ft., and truck grader ice blades are covered in literature from Wausau Iron Works, Wausau, Wisc. Check the reply card.

Rock Salt For Ice and Snow Removal

534. Application rates and procedures of using Morton rock salt for ice and snow control are covered in catalog from Morton Salt Co., 110 No. Wacker Drive, Chicago 6, Ill. Check the reply card for Catalog F-35.

●

BUSINESS ADMINISTRATION

System For Duplicating and Filing Engineering Drawings

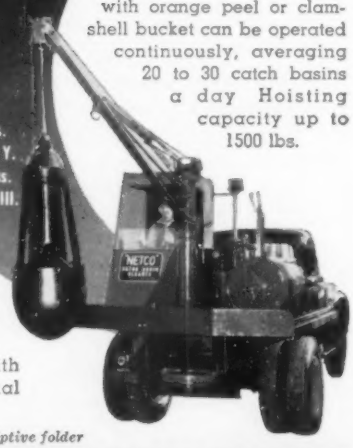
754. The Recordak system for comprehensive filing of engineering drawings is described in literature available from Recordak Corp., 415 Madison Ave., New York 17, N.Y. Drawings are first microfilmed and then they are added to an aperture card for indexing.

These Cities, States & Turnpikes Are Doing More Work and Paying Less with the

NETCO Catch Basin Cleaner

Penn. Turnpike Comm.
East Cleveland, Ohio
Cumberland, Maryland
Indianapolis, Ind.
Lansing, Michigan
Jersey City, N. J.
Worcester, Mass.
New York, N. Y.
Boston, Mass.
Chicago, Ill.

Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the NETCO with orange peel or clam-shell bucket can be operated continuously, averaging 20 to 30 catch basins a day Hoisting capacity up to 1500 lbs.



NETCO does almost three times as many basins a day at less than half the cost per basin compared with old-fashioned manual methods.

Send for our 6-page descriptive folder

NETCO DIVISION
CLARK-WILCOX COMPANY
118 Western Avenue
Boston 34, Massachusetts

GOOD ROADS "CHAMPION" SNOW PLOWS

REVERSIBLE • ONE-WAY • V-PLOWS • RIGID PLOWS

Good Roads Snow Plows perform smoothly and efficiently under the most adverse snow removal conditions. These rugged, heavy-duty plows are engineered to provide safe, speedy snow removal on highways, roads, streets, parking lots and airports.

Model 100 Reversible and 700 One-Way Plows are equipped with the exclusive Good Roads spring-cushioned, safety-blade trip device with automatic return for safe plowing at high speeds, protecting men and equipment.

For further information on models available, write:

Good Roads MACHINERY
GOOD ROADS MACHINERY Corp.
MINERVA, OHIO

The Hon. Thelma Stovall, Secretary of State, Commonwealth of Kentucky, holds unitized microfilm jacket and microfilm security roll

Cost of filing corporation papers cut 96% with Recordak Microfilming

Making a record of corporation papers filed with the office of the Secretary of State of Kentucky used to cost $.15 a page. Now it's done for $.005 per page the Recordak way. Annual savings run close to $10,000 a year!

This new system is more convenient, safe, too! Duplicate microfilm strips are made of all documents. One copy is inserted in unitized acetate jacket—always handy for reference, saves hours of clerical time each day. The other copy is kept in roll form, filed for greatest security—always available should the need arise.

Whole year's file on 12 rolls! That's right—thousands of documents, tens of thousands of pages received in the last twelve months by the Secretary of State of Kentucky—and they all fit on 12 100-ft. rolls of Recordak Microfilm. Older documents, some dating back to 1792, are also being microfilmed. Result: 2 filing cabinets have replaced 65 cabinets!

Learn how your agency can profit with Recordak Microfilming. Prices start at a low $550 for the Recordak Junior Microfilmer with built-in film reader! Also available on low-cost rental plan. Mail coupon today.

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To order these helpful booklets check the reply card opposite page 36.

In greatest demand...

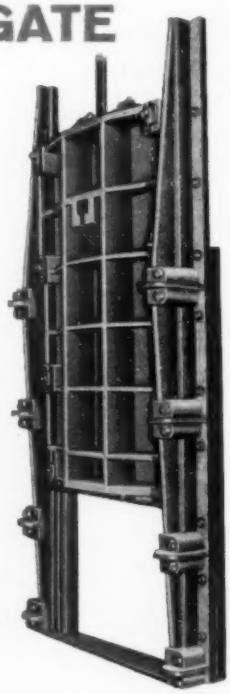
Today more engineers are specifying Rodney Hunt HY-Q Sluice Gates by name than any other gate. The reason for this strong preference is found in the inherent advantages of the HY-Q flush bottom closure design.

Unlike any other design, the HY-Q gate seats on a sill which is flush with the invert. There is no vertical sill wall or trough to create turbulence, trap debris and silt, obstruct free flow, prevent proper seating of the gate. It permits complete drainage of the channel without pumps and assures maximum hydraulic gradient at the bottom of the gate.

HY-Q® SLUICE GATE

The first basic sluice gate improvement in years features a resilient seal fastened to the bottom of the sliding disc to provide a cushioned closing at the stop bar. This flush bottom closure results in specific construction economies for a given volume of flow... smaller gate size, narrower channels, lower channel walls. It provides unmatched design flexibility for water, sewage treatment and similar projects... with more than 80 gate sizes available, ranging from 12″ x 12″ to 190″ x 120″.

For full design and specification data, write for your copy of Catalog 75.



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Water Control Equipment Division
82 Water Street, Orange, Mass., U. S. A.

Serving water control engineers with equipment and engineering

REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy reply card.

Refuse and Garbage Packer Bodies

241. Ranging in capacity from 12 to 24 cu. yds., the M-B packers have a 30 second compaction cycle and have large side loading doors. Write M-B Corp., New Holstein, Wisc., or check the reply card for bulletin on specifications.

General Specifications for Refuse and Garbage Trailers

251. Two bulletins, one on the Pak-Mor 38 cu. yd. tandem axle trailer unit and the other on the Pak-Mor 32 cu. yd. trailer for use with Model GRD Dempster are available from Pak-Mor Manufacturing Co., Box 6147, San Antonio, Texas. General specifications, power train, operating procedures, maintenance and lubrication and other helpful information are included.

Planning A Sanitary Landfill

287. Covered in this manual is how to work various types of terrain efficiently for sanitary landfills. Swampy land, river bottom land, gravel pits, strip mines, and flat land operation are the sections. Write to Caterpillar Tractor Co., Peoria, Ill., or check the reply card for your copy.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 17 and 22 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the reply card.

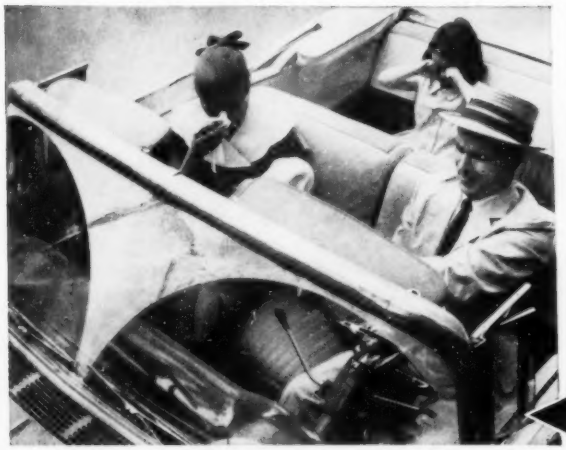
Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Check the reply card today.

Data on Refuse Collection Bodies

615. The Hydro E-Z Pack compacting unit has only 2 working parts—a high volume roller bearing pump and a double-acting telescopic cylinder. A refuse-crushing compacting pressure of 82,500 lbs. is attained in the units. Write Hydro E-Z Pack Co., Galion, O., or check the reply card for complete specifications.

Apply one proved answer to 3 current jobs:



ECONOMICAL

COLUMBIA CALCIUM CHLORIDE

You can sit down and plan *right now* how to make your maintenance jobs a lot easier for the next six months. Figure needs, cost, dependability, service . . . and you'll come out with COLUMBIA CALCIUM CHLORIDE. Look at how this long-accepted, versatile helper works for you to:

KEEP DUST DOWN

Dust can be at its worst after the dry summer months. "Sweetening" applications of COLUMBIA CALCIUM CHLORIDE lay dust effectively, prevent further loss of material. Motorists, homeowners, business establishments, livestock, crops—all do better when you control choking end-of-summer dust.

CONSOLIDATE AGAINST BAD WEATHER

Spring maintenance is much less expensive if you consolidate *now* against late fall rains and winter weather. Patrol blading to move loosened material back onto the road, minimum recrowning, COLUMBIA CALCIUM CHLORIDE application for better bearing . . . these days of work save weeks of effort later.

CONTROL ICE AND SNOW

No other material works with and extends your abrasives like COLUMBIA CALCIUM CHLORIDE. Its fast, uniform melting action helps abrasives to imbed in slick surfaces. The melting and grinding actions that result open roads and streets for *safe* traffic hours sooner. And COLUMBIA CALCIUM CHLORIDE keeps stockpiles workable in freezing temperatures.

Want more information? Just contact your nearest Columbia-Southern District Sales Office. They're all listed below.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

A Subsidiary of Pittsburgh Plate Glass Company

DISTRICT OFFICES: Cincinnati, Charlotte, Chicago, Cleveland, Boston, New York, St. Louis, Minneapolis, New Orleans, Dallas, Houston, Pittsburgh, Philadelphia, San Francisco IN CANADA: Standard Chemical Limited

Specify GAR WOOD...

For excavating and material-handling, Gar Wood's rugged, full ¾ yard machine gives you bonus capacity. Independent travel lets operator hoist or swing while moving . . . built-in chain crowd puts full engine power into every bite, simplifies conversion.

for a bigger return on your equipment dollar!

Why do municipalities choose more Gar Wood-St. Paul refuse collection equipment than all other makes combined? Because with Gar Wood, they know their equipment dollars buy lower operating and maintenance costs... faster, more efficient operation... years of extra service. A good example is the LOAD-PACKER 500:

GIANT 1½ CUBIC YARD HOPPER on this advanced unit is the biggest on the market. BIG loading area—a full 75-inches wide—speeds collections. And, hopper is close to the ground for easy loading!

REVOLUTIONARY CYCLOMATIC PACKING SYSTEM on the "500" lets crew start to reload hopper just 4 seconds after packing cycle begins. Complete packing cycle takes only *10 seconds.*

UP TO 25% BIGGER LOADS—Dual packing cylinders exert 81,000 lbs. of force directly at floor level. Refuse is thoroughly crushed and compacted.

See for yourself! Compare Gar Wood equipment with any other make. You'll agree that with Gar Wood, your equipment dollar will buy better and more economical service for your municipality. For more information, write to Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

New Gar Wood Pax-all Refuse Containers snap quickly on or off the LOAD-PACKER 500 without use of chains or cables. Complete hydraulic operation is controlled with one lever. Simple, yet rugged design stands up under day-in, day-out use.

For utility ditching, Gar Wood-Buckeye offers a complete line of wheel- and ladder-type machines to fit every municipal need. Buckeye ditchers are famous for advanced hydraulics that simplify operation . . . power-saving transmission that cuts fuel costs.

For street or road maintenance, Gar Wood-St. Paul hoists and bodies offer lower cost operation per payload hour. Dump bodies are stress-tested to put strength where it's needed, eliminating excess weight. Hoists are designed for smoother, more dependable operation throughout dumping cycle. You choose from the world's largest line of truck equipment!

Gar Wood
INDUSTRIES, INC.
Wayne, Michigan

Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.; Exeter, Penna.

The keynote is economy in

Philadelphia's most advanced refuse disposal plant

That's why C-E Incinerator Stokers were specified

In planning its ultra-modern Northwest Incinerator Plant, the City of Philadelphia has recognized the important advantages of continuous operation — through the use of Combustion's traveling grate stokers. Two C-E Stoker Systems are now on order for this plant. Each incinerating furnace employs an inclined drying stoker and a horizontal burning stoker. Each system will be capable of incinerating 300 tons of refuse daily.

Philadelphia's choice of 'continuous processing' over the widely-used 'batch processing' is a matter of sound economics, for every C-E Incinerator Stoker System now operating has service-proved its labor saving and reliability attributes. From the time refuse is deposited into the self-sealing, non-clogging hopper until the residue is ready to be hauled away, only minimum operating attention is needed.

Decontaminated refuse, as it is discharged from the C-E Incinerator Stoker, provides a sanitary, inoffensive fill for reclamation of waste lands, swamps and other recoverable areas.

Where it is desirable to obtain steam for heating, power or process needs, the addition of a boiler to utilize the heat produced by the incinerator provides an exceptionally economical arrangement. Auxiliary oil-firing equipment can be supplied to assure continuity of steam output regardless of incinerator load.

The C-E Incinerator Stoker is designed to handle all types of combustible refuse in quantities ranging upward from 50 tons per 24-hour day.

For further information, please contact the Combustion office in your city, or write directly to Combustion Engineering, Inc., 200 Madison Avenue, New York 16, N. Y.

See us at the 1958 Public Works Congress and Equipment Show in Kansas City . . . September 28 to October 1 . . . booths B-17 and B-18.

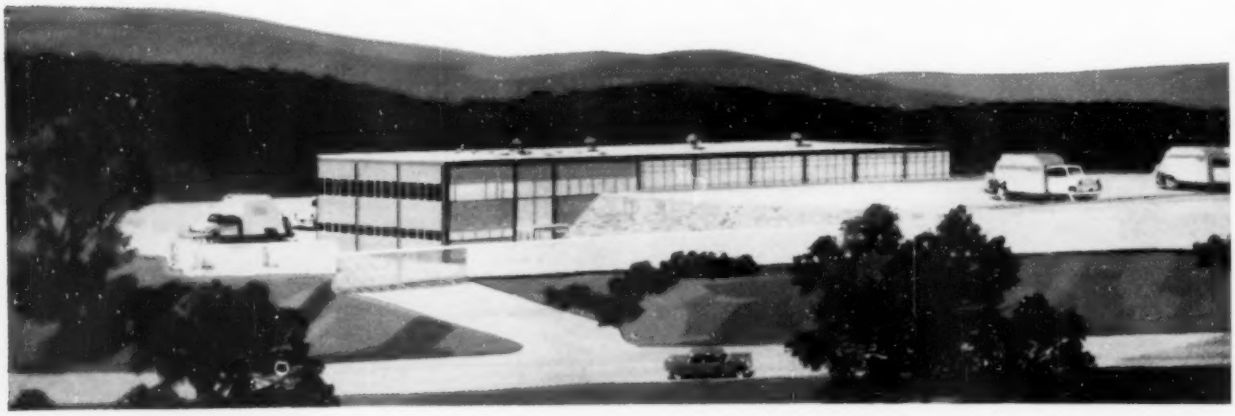
COMBUSTION ENGINEERING

C-E

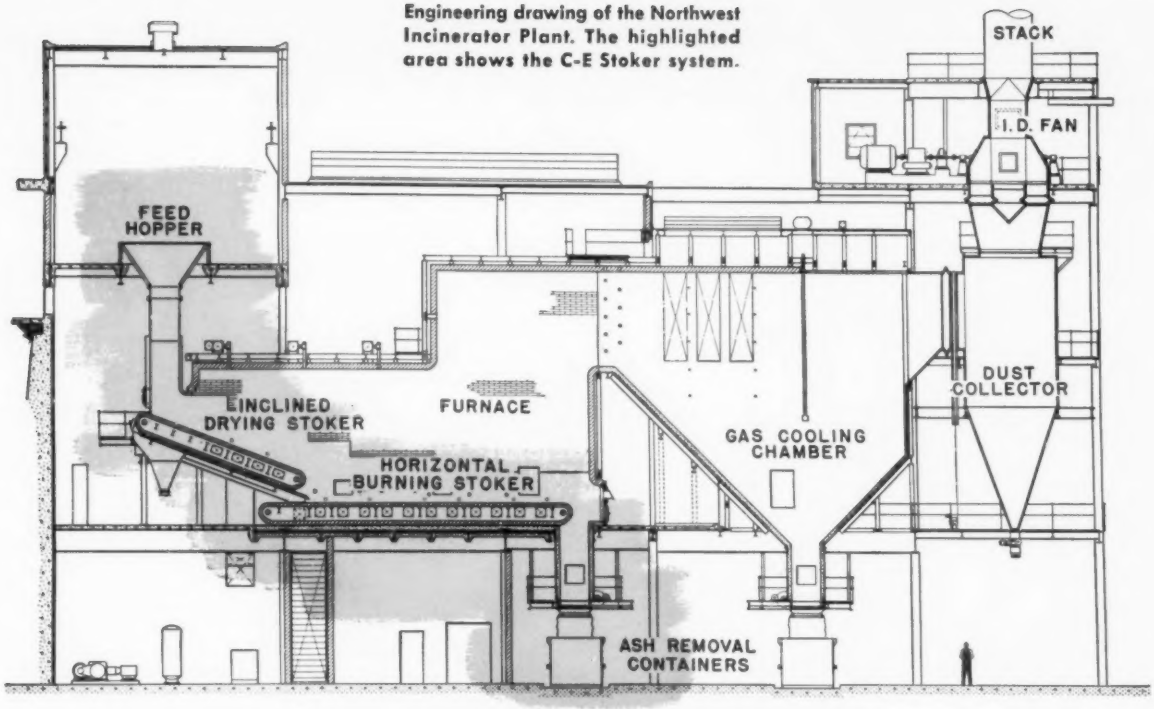
C-176

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



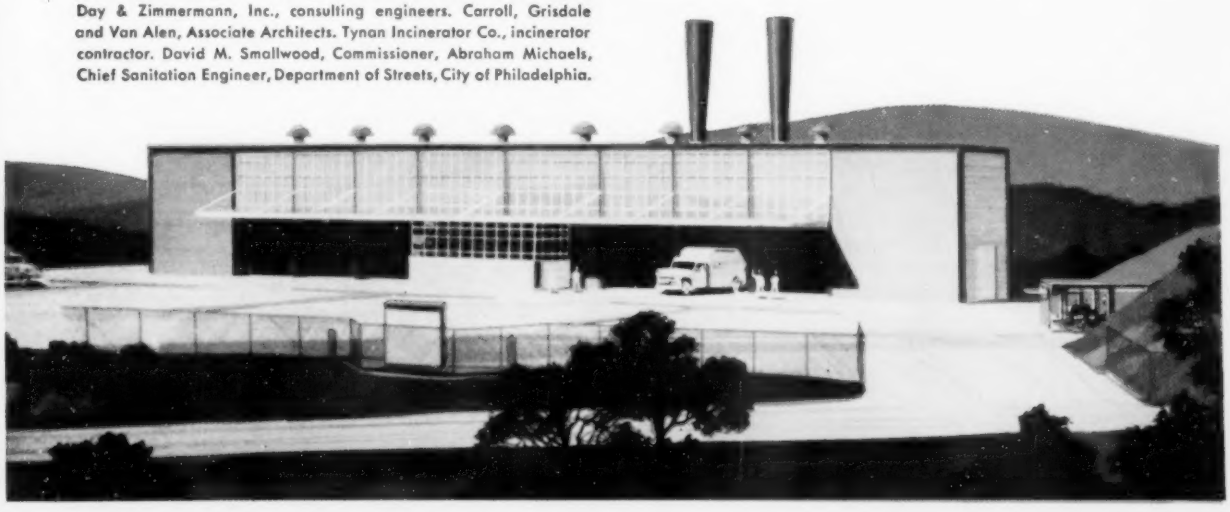
Engineering drawing of the Northwest Incinerator Plant. The highlighted area shows the C-E Stoker system.



HIGHLIGHTS OF C-E DESIGN

- Large hopper and chute provide sealed, continuous supply of refuse.
- Feed of refuse is unobstructed, non-clogging.
- Advance of fuel bed from front to rear is positive, continuous.
- Supply of air to fuel-bed is zone-controlled.
- Residue is discharged continuously from grate surface.
- Operation is easy — no heavy stoking or cleaning of fires.
- Chrome cast iron — most suitable material — is used for grate surface.
- Wide keys over driving chains prevent fouling.
- Grate elements are easily replaceable.
- Steel driving chains take all tension.
- Take-up mechanism is easily accessible at front.
- Maximum availability is assured.
- Stokers are applicable to largest incinerators.
- Less labor is required than with any other burning method.

Architect's drawing of Philadelphia's Northwest Sanitation Facilities. Day & Zimmermann, Inc., consulting engineers. Carroll, Grisdale and Van Alen, Associate Architects. Tynan Incinerator Co., incinerator contractor. David M. Smallwood, Commissioner, Abraham Michaels, Chief Sanitation Engineer, Department of Streets, City of Philadelphia.



3 top contractors tell how **Transite Sewer Pipe** helped keep installation costs low on the Allegheny County Sanitary Authority sewage project (Allegheny County, Pa.)

"Transite saved us considerable labor especially when we were working in 18- to 28-foot trenches . . ."

says W. R. Davies, W. R. Davies Company
Pittsburgh, Pennsylvania

"For the Allegheny County Sanitary Authority we used Transite Pipe for Sanitary Sewers because it is faster to install, lighter, and more readily handled than the other materials specified as alternates. Transite saved us considerable labor especially when we were working in 18- to 28-foot trenches.

"Another part of our 'Authority' contract included the installation of 5,300 feet of Domestic Water and Fire lines at the 150 MGD capacity Pittsburgh Sewage Treatment Plant. We used Transite Pressure Pipe for this entire job. Our costs were low because it is faster to install."

W. R. Davies Co. installation.

"In a remarkably short time, our men installed two miles of Transite . . . even though they worked below the adjacent river level . . . and between railroad tracks and one of the most congested highways in the county . . ."

says P. A. Benintend, Ben Construction Company
Pittsburgh, Pennsylvania

"For the Allegheny County Sanitary Authority Contract, Transite's ease of installation . . . sure coupling . . . and 13-foot lengths saved money for us in over-all installation. In a remarkably short time, our men installed two miles of Transite Sewer Pipe and force mains, even though they worked below the adjacent river level to install the force main—and between railroad tracks and one of the most congested highways in the county to install the sewer. Speed of installation plus prompt delivery enabled us to finish the job well before the required completion date."

"We installed Transite Sewer Pipe in some of the toughest locations on this job."

says D. C. Rothey, Project Manager
Harrison Construction Company
Pittsburgh, Pennsylvania

"In our stretch down along the Allegheny River we were constantly 5 to 14 feet below normal pool stage level. Final inspection revealed no infiltration."

Transite Sewer Pipe installations on the $100-million Allegheny County Sanitary Authority Project. Shown here is part of Harrison Construction Co. contract.

Ben Construction Co. installation.

How TRANSITE PIPE answers your two most important problems in sewer installation and operation!

In installation, your big problem is time. For the longer it takes to complete a "tight" installation the more it costs . . . the more annoying the problem of torn-up, detoured streets. And this is where Transite® pays its way in time-saving alone. Its lightweight, long lengths and quickly, *surely* assembled Ring-Tite® Coupling speed every step of installation.

In operation, infiltration and root-clogging can be even more costly. But they're problems that Transite's Ring-Tite® Coupling was designed to solve. Rubber sealing rings, tightly compressed between sleeve and pipe, give you a tight, long-lasting joint that locks out roots . . . seals out unwanted ground water.

Let us send you booklet TR-165A. Address Johns-Manville, PW Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

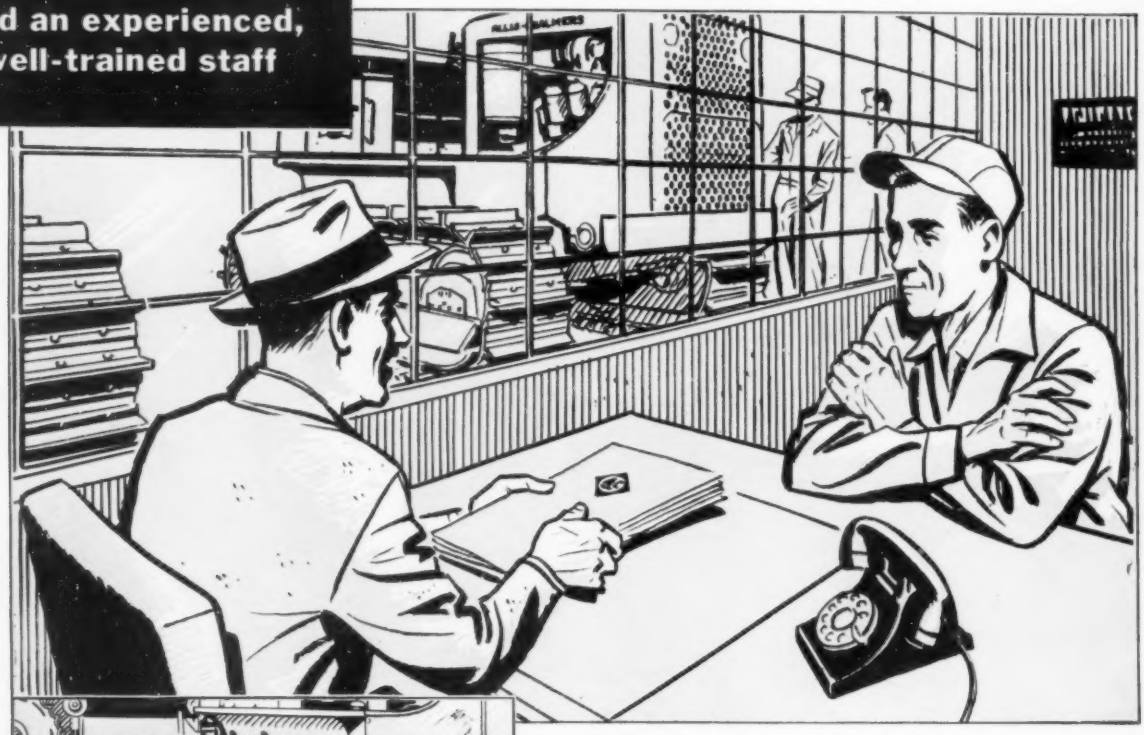
JOHNS-MANVILLE

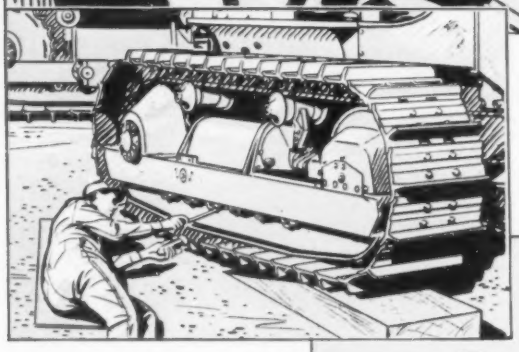
JOHNS-MANVILLE JM PRODUCTS

Your Allis-Chalmers dealer

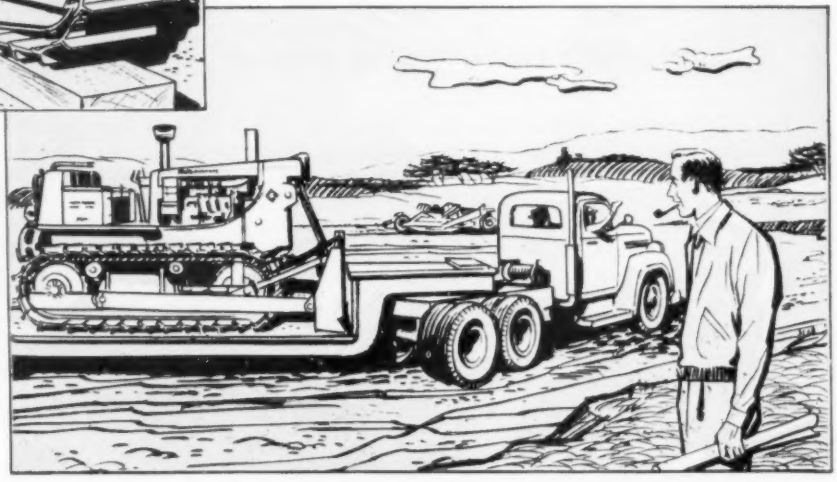
...backed by modern facilities and an experienced, well-trained staff

Your Allis-Chalmers dealer *knows* the equipment he sells. He can give you the expert service in shop and field that results in "like-new" performance from every Allis-Chalmers unit in your fleet... keeps them producing on your jobs.



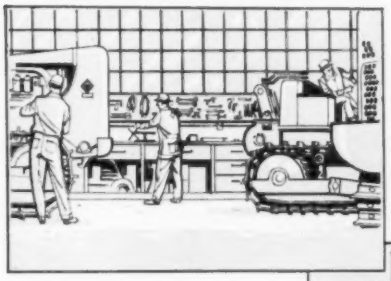


Detailed information on maintenance, adjustments and other facts on care of the machinery is delivered with the equipment. Operating tips are passed along to your men—to help them get started right and get the most from their equipment.



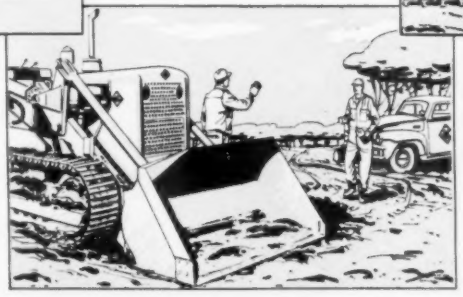
Careful pre-delivery servicing assures that Allis-Chalmers construction machines have been thoroughly checked ...and that they're ready for work as soon as you get them.

is a specialist in service



Shop service at your Allis-Chalmers dealer is fast and efficient—because it's handled by factory-trained men, using factory-approved tools, equipment and methods. Specialized mechanics and special facilities all help to speed service.

Scheduling checkups with your Allis-Chalmers dealer will insure that proper maintenance procedures are followed . . . stop trouble before it starts . . . keep your machines producing.



Prompt field service—a call—any time, day or night—brings a qualified serviceman and a fully equipped "mobile workshop." Result—problems can be quickly and accurately solved . . . equipment put back on the job with minimum delay.

. . . backed by a ready stock of original specification parts

ENGINEERED RIGHT

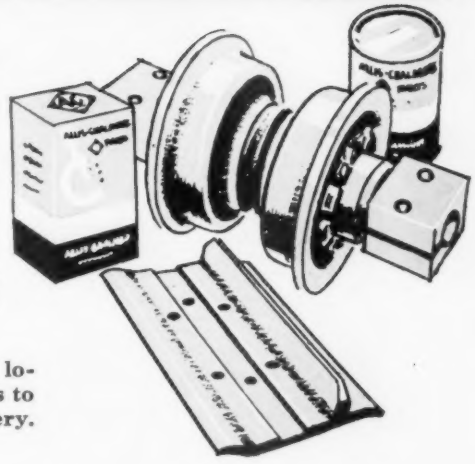
Allis-Chalmers parts are designed as original equipment . . . benefit from intensive metallurgical research. And each comes from the drawing boards of experienced construction machinery engineers.

MANUFACTURED RIGHT

Precision-made parts assure long-life service. They're made by skilled craftsmen on modern industrial machinery and are subjected to original-equipment inspection and testing.

TO PERFORM RIGHT

Each part is made of top-quality material, heat-treated to correct hardness and made to exact specifications. You can depend on them for full-capacity production on the toughest jobs you have.



The men of your Allis-Chalmers dealer organization know local conditions. Look to them for equipment recommendations to fit your job requirements . . . for true value in used machinery.

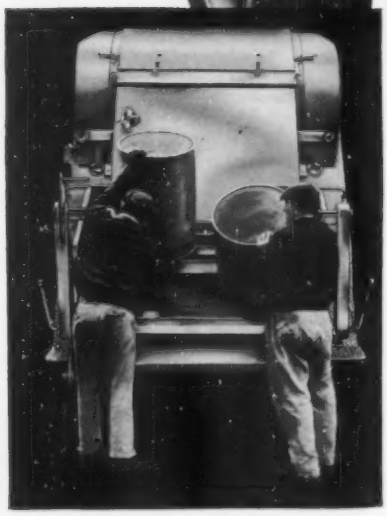
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

Look ahead... *move ahead*...and stay ahead

with ALLIS-CHALMERS

NEW! WIDE HOPPER ROTO·PAC

means *fastest* refuse collection ever

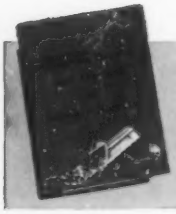


TWO MEN LOAD AT THE SAME TIME

THE ONLY REFUSE COLLECTION UNIT WITH AUTOMATIC CONTINUOUS COMPACTION

Here it is . . . another big advantage with ROTOPAC. Now, ROTOPAC's new 56½" wide hopper speeds loading, permits two men to load at the same time. Thus, with faster loading and no time wasted for compaction, ROTOPAC picks up more than three loads in less time than it takes ordinary, batch-type units to pick up two loads. Imagine how ROTOPAC, with this unequalled efficiency, can cut the cost of your community's refuse collection—picking up more refuse faster with far less units.

Booth #A 45-46-47-48, at the 1958 Public Works Congress & Equipment Show, Kansas City, Mo.

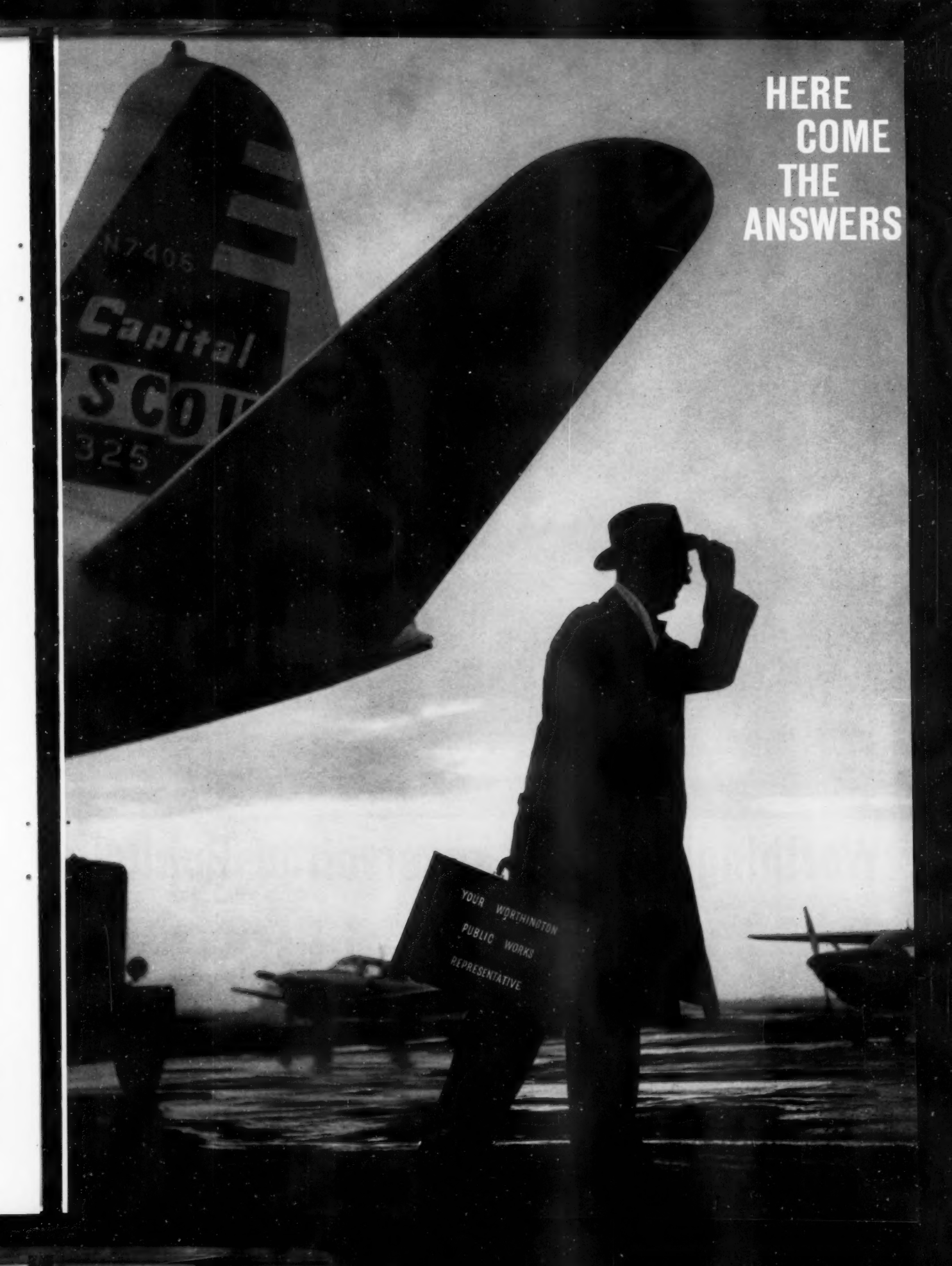


For all the facts on ROTOPAC—its non-selective loading, its proven record of minimum maintenance, and its greater preference among loaders—write for helpful brochure.

CITY TANK CORP.

53-09 97th Place, Corona, N. Y.

Sales and Service in All Principal Cities

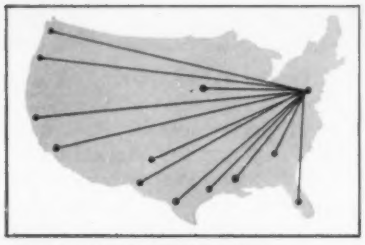

HERE COME THE ANSWERS
Capital
YOUR WORTHINGTON
PUBLIC WORKS
REPRESENTATIVE

Worthington's vast reservoir of Public

In Public Works there is no adequate substitute for experience. Worthington's experience in this essential field dates back to 1854 when the company's founder installed his first municipal water works pumps at Savannah, Georgia. Others soon followed. A duplex pump was installed at Charlestown, Massachusetts in 1863. Pumping engines were installed in Fort Worth, Texas in 1893. Twelve triple-expansion engines were put in at Philadelphia, Pennsylvania in 1908. Now the list is almost endless. There is hardly a municipality in the United States today that does not have a Worthington pump, compressor, engine or comminutor in service. This vast, cumulative experience and know-how proves invaluable year-in, year-out to communities in search of the very finest in service and equipment.

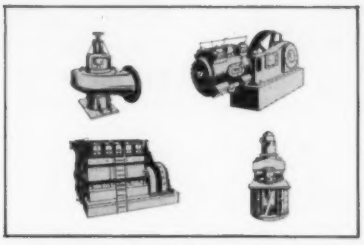
Key personnel in Worthington's Public Works Department have a combined experience in all phases of water and sewage plants of over 100 years.

Works experience is at your service



NATION-WIDE EXPERIENCE

Public Works representatives from Worthington criss-crossed the nation during 1957 bringing their knowledge to hundreds of municipalities. In so doing, they increased their skills by solving scores of local problems on equipment selection and application.



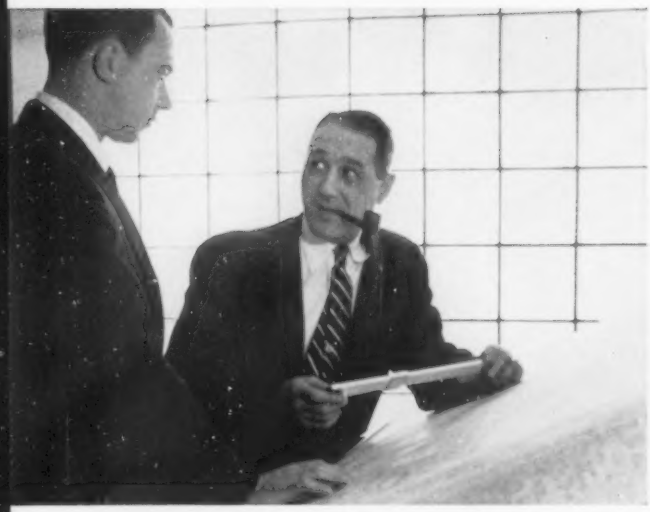
EXTENSIVE PRODUCT EXPERIENCE

Worthington makes a complete line of specialized equipment for water and sewage works. These are Worthington's basic products and the year they were introduced. Pumps (1840), Compressors (1893), Engines (1896), and Comminutors (1948).

REGIONAL REPRESENTATION

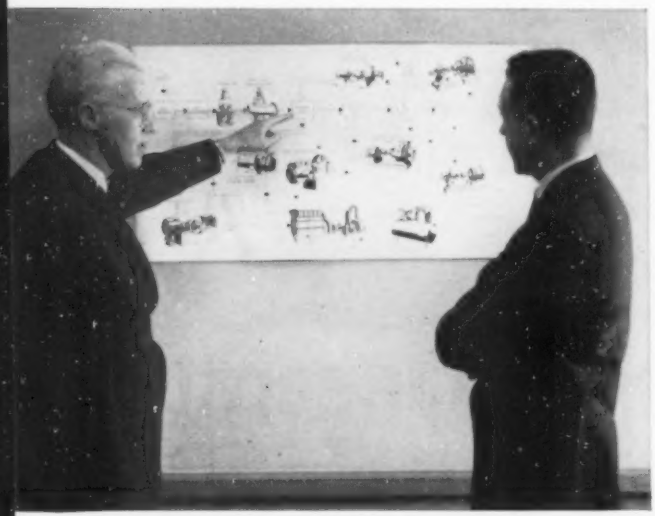
A network of Worthington Offices spans the nation, from New England to California, from Canada to Mexico. Staffed with experts trained in every phase of Public Works, these offices are your assurance of the best possible equipment and the finest possible application.

THE 4 BASIC SERVICES
of Worthington's Public Works Department

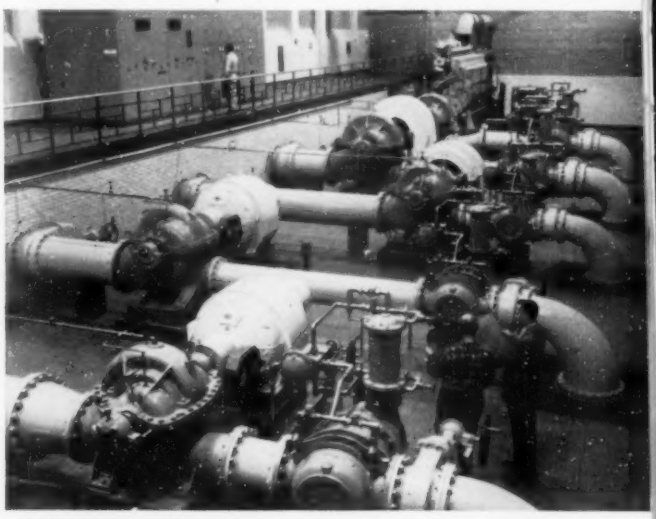


PLANNING Worthington experts will assist your consulting engineers in planning water and sewage plants. This coordinated planning care is why so many Worthington users report such long, outstandingly trouble-free operations.

EQUIPMENT COORDINATION Every municipality is different. No two systems are alike. That's why equipment must be versatile and coordinated. Because Worthington makes so wide a range of equipment, the most complex problems are quickly solved without compromising effectiveness of the system in any way.



EQUIPMENT SELECTION Because Worthington designs and manufactures a complete line of equipment, a Public Works Representative can make a substantial contribution to the operation of every plant. Using Worthington equipment limits your supply responsibility – makes for greater plant efficiency and integration.



INSTALLATION Public Works specialists are few and far between. Worthington is fortunate in having so many on its staff. They will work with your consulting or contracting engineer in solving installation problems of equipment. It's the soundest way to build *dependability* in your systems.

WORTHINGTON

For illustrated brochure on Worthington's Public Works Department, or address of your nearest Worthington District Office, write: Worthington Corporation, Section 105-3, Harrison, New Jersey.

This Pocatello, Idaho, storm sewer in good condition after 44 years

In 1914, Pocatello, Idaho, installed this 36-inch-diameter Armco Corrugated Metal Pipe as a storm sewer. A 1957 inspection of this pipe revealed practically no corrosion, no erosion. The sewer is good for many more years of service.

LOW COST THROUGH LONG LIFE

Armco Corrugated Metal Structures have been used as storm and sanitary sewers throughout the country for the past half-century. Many of these are still giving good service today. This durability, coupled with low maintenance costs, assures long-term savings with Armco Corrugated Metal Structures.

Over the years since the Pocatello sewer line was installed, Armco's continuing research program has developed even more durable products to meet severe corrosive and erosive conditions. For information on the newest of these improved products—Armco SMOOTH-FLO® Sewer Pipe—just fill in and mail the coupon.

Armco Drainage & Metal Products, Inc., 3198 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO DRAINAGE & METAL PRODUCTS, INC.
3198 Curtis Street, Middletown, Ohio
Send me the folder, "Armco SMOOTH-FLO Sewer Pipe."

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Position_____
Street_____
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ARMCO SEWER STRUCTURES

SUN-MASTR® MOWERS

The Choice of One Highway Department

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Chosen By Two More Highway Departments

A Wide Range of Models For City Parks and Playgrounds

Manufacturers of the Nation's Most Complete Line of Tractor Operated Mowing Equipment.

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

The Pursuit of Happiness on a Golf Course

Lyshak v. City of Detroit, 351 Mich. 230, 88 N.W. (2d) 596, a Michigan case decided March 4, 1958, involved the case of a seven year old boy whose eye was put out when he was struck by a golf ball as he played, with other boys, on a municipal golf course.

The defendants were three of the "foursome" players (one of whom had driven the ball which blinded the boy), the City of Detroit, and the golf "pro" or concessionaire. The City received a percentage of the gross receipts from the concessionaire.

At the trial, the judge directed verdicts of no cause of action for all the defendants except the City of Detroit, and the jury awarded a verdict of $53,000 against the City. The trial court refused to enter this verdict, as against the great weight of evidence, and instead entered a judgment notwithstanding the verdict, in favor of the City.

The plaintiffs (father and son) appealed from this latter action of the court. The basis of the plaintiff's argument was that defendant (the city) knew that children were constantly coming onto the golf course during the summer months, just as they had been doing for a long period of time. Therefore, there arose a duty to keep a lookout for them and to discover their presence when in a dangerous situation. The City, on the other hand, said that it was under no duty to trespassers to keep its premises safe, or to keep the premises safe for the use of children as a playground.

The appellate court reversed the trial judge's action, and reinstated the jury verdict, saying: "In the case before us, a great city maintained, in a densely populated residential section, a park-like area, a golf course, with ample lawn, trees, and a little creek. Upon this area, in the summer, children entered daily. They were drawn to it for purposes of play as naturally as the dog to the bait. The City of Detroit knew this . . . However, knowing of the daily entrance of children onto the course, for purposes of childish play, the city . . . nevertheless continued to conduct thereon an enterprise of such character as to subject these children to risk of grave bodily injury, resulting in infant plaintiff's loss of one eye." Although the City forbade entrance to the course except to players at the conclusion of the winter sports, posted signs containing warnings: "The city will not be responsible for injuries sustained . . . Danger, golf course, for players only", evicted some children from the course, and used employees (when not otherwise busy) as "rangers" to patrol the course, the court said this was not enough. The fact that the child had entered the course by crawling under a hole in the fence did not prevent him from recovering either. According to the court, "the difference between a golf course and a rifle range . . . as a playground for children, is a difference of degree only." (The court also indicated that there was less straight-shooting on the golf course.)

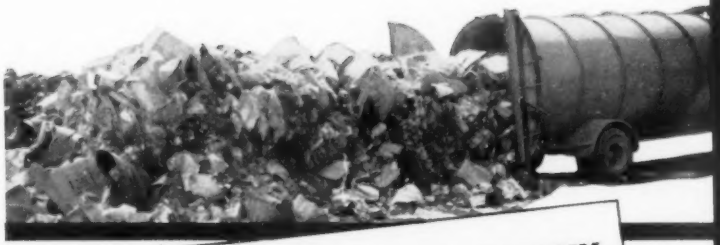
In short, as the court said, "The right of a child to life, and life unmaimed, outweighs the landowner's right to the exclusive possession of his property."

Bad Bid in Bad Axe

Lasky v. City of Bad Axe, 89 N. W. (2d) 520, a Michigan case decided April 14, 1958, was an action by a contractor against the City of Bad Axe for breach of contract for the construction of a sewage disposal plant.

The City of Bad Axe wanted a sewage disposal plant and in November 1953, after some years of consultation and planning with ex-

OUR Lo Boye MAKES 3-16 YARD PACKER LOADS IN ONE . . . AND HANDLES EVERYTHING WE HAVE TO PICK UP



Julian Quigley
Quigley Disposal Company

QUIGLEY DISPOSAL COMPANY
CHESTERLAND, OHIO

August 5, 1958

Mr. Thomas P. Hopkins
Pak-Mor Manufacturing Co.
San Antonio, Texas

Dear Tom:

Here are a few facts on our Lo Boye operation for the past three months:

We've checked load for load and stop for stop - and our Lo Boye operational cost is quite a bit under our other packer truck costs. Here's what I mean by that: Gas consumption per day on our Lo Boye averages 5 gals. Load weights average from 18,000 to 22,000 lbs. We work 9 hrs. a day with 4 men picking up 3 loads per day -- average load takes 1/2 hour for lubrication -- and washing and cleaning takes about 2 hours. Maintenance each week takes about 2 hours.

This Lo Boye will take in one load what our other 16 yd. Packers would have to make 3 loads to get. We feel sure that one year of operation with the Lo Boye will save us enough time, labor, gas and those costly trips to the dump, so that we'll have our initial investment back.

To me, this machine is a dollar-saver and that's because the simple operation and ease of loading and also the fact that everything we have to pick up - can be put into this machine. With our other packers we're limited. Another big thing is the speed of operation. The Lo Boye has a larger hopper and so consequently we spend less time in packing than with our other machines.

Our men are very satisfied with this machine since it certainly makes their day easier and gets them home sooner.

I just thought you'd like to know how I'm getting along with the Lo Boye and I'm enclosing some photos which were taken of the Lo Boye's operation.

Very sincerely yours,
QUIGLEY DISPOSAL COMPANY
Julian Quigley
Julian Quigley

JQ/ars

Simple Push-Button Control

New Lo Loading Height

SEE PAK-MOR'S *Lo Boye* IN BOOTHS A-34, A-35 AND A-36 AT THE APWA CONVENTION, KANSAS CITY

Write for "The King of All Refuse Fleets and Systems" and the name of your nearest PAK-MOR Distributor.

SANITATION FOR THE NATION

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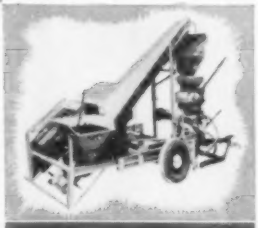
Public Works Officials in Many Cities, Counties, States and Provinces

MAKE BUDGET DOLLARS DO MORE WITH AIRPLACO CONCRETE GUNNING EQUIPMENT

When the Job Calls for Concrete . . . Call for AIRPLACO

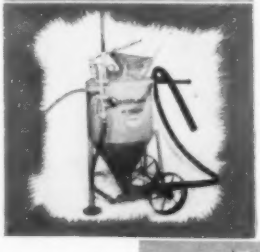
AIRPLACO CONCRETE GUNS for Restoration and Repair of Roads, Streets, Bridges, Culverts, etc. Choose from six different models in a complete line of concrete guns. Whatever your production requirements—from ½ to 8 cu. yds. per hour—there is an AIRPLACO BONDACTOR or NUCRETOR to meet your needs.



AIRPLACO MIX-ELVATORS for Faster, Easier Proportioning, Mixing, Elevating and Screening. Choose from three models. Capacity up to 12 yds. per hour.

AIRPLACO GROUTER AND PLACER for Easy-to-Use, Versatile Grouting and Placing of Concrete and Other Materials.

The portable Model G-6 Grouter and CP-10 Placer is ideal for soil stabilization, tunnel backfilling, filling hard to get to forms, etc. Both the G-6 and CP-10 have capacities of up to 5 cu. yds. or more depending on materials used and job conditions.



AIRPLACO JET-BLASTERS For Low-Cost, Easy-to-Use Sandblasting (wet or dry). The Model B-6 single charge (650-lb. capacity) and B-3C continuous feed (500-lb. capacity) Jet-Blasters are designed to handle all abrasive materials for cleaning, polishing, or etching of any type of surface. Jet-Blasters are available with accessories for wet or dry blasting and new exclusive "Sand-Saver" remote cut-off valve.

Get All the Facts . . . **FREE!**

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AIRPLACO® **AIR PLACEMENT EQUIPMENT CO.**

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MANUFACTURERS OF ADVANCED DESIGN CONCRETE GUNNING, MIXING, GROUTING AND SANDBLASTING EQUIPMENT.

perts, it advertised for sealed bids for the construction of the plant in accordance with elaborate specifications furnished by its engineer. Six bids were received and were duly opened at a meeting of the City Council on Dec. 14, 1953. Plaintiff Lasky's bid was $309,250 on the basis of 360-day completion, and a bid by a second party was $310,-999.93 for a 290-day completion. The other bids were higher.

The specifications called for the furnishing of a supervisory resident engineer by the City during the construction at $35 per day additional. Therefore, there arose a dispute at the Council meeting as to whether Lasky's or the second bid was the lowest, considering the extra 70 days construction time of Lasky. No formal action was taken by the City Council at that time.

The second lowest bidder undertook to change his bid the night of the Council meeting by agreeing to a liquidated damage clause, and by letter the next day reduced his bid to $299,136. Plaintiff, several days later, by letter also agreed to a liquidated damage clause and reduced his completion time to 290 days. Subsequently, plaintiff agreed to reduce his bid $7000 further if certain changes in the specifications could be made. The changes were agreed to and plaintiff's amended bid was finally accepted.

A few weeks later, the Council passed a resolution rescinding the prior resolution which had adopted plaintiff's amended bid. Subsequently, new specifications were drawn and a new contract was let to the second bidder, who built the plant.

Plaintiff, insisting on the validity of the first contract, brought suit for breach of contract.

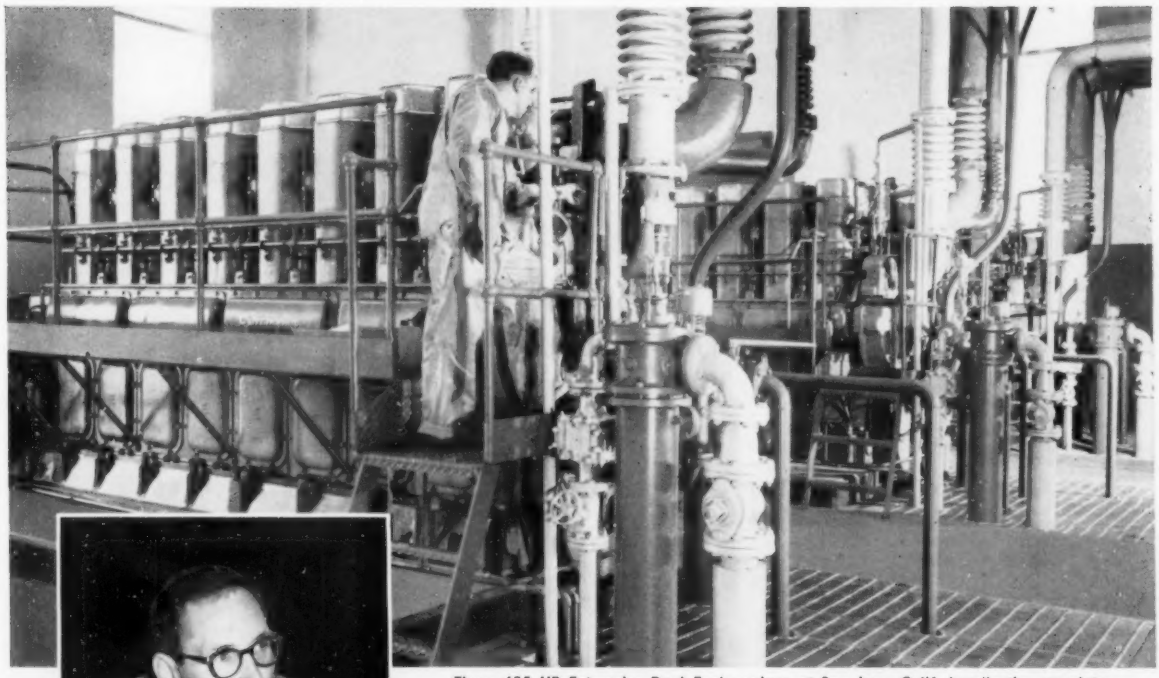
The Michigan Supreme Court held that he had no cause of action, because the Council's action in accepting his amended bid was a nullity. It is not lawful for municipal officials to negotiate with and obtain concessions from one of several competitive bidders after the sealed bids are opened.

• • •

Asphalt Plant and Paving Equipment for Marinette

An asphalt plant has been purchased by Marinette, Wisc., for $33,879; a used asphalt paver for $9,500; and an oil heater for $4,467. The paver may be turned in for a new unit within six months at the full price paid. Hereafter, paving, asphalt curbs and gutters will be constructed by force account.

Enterprise Engines Run 90% on Free Sewage Gas



Three 625 HP Enterprise Dual Fuel engines at San Jose, Calif. handle the complete power load for all electrical and pumping requirements of this sewage plant.

"Trouble-free and maintenance-free, with very reasonable manpower requirements."

Frank M. Belick

Supt., San Jose, Calif., Sewage Treatment Plant

"We're extremely pleased with the record of efficiency and economy experienced to date with our three Enterprise Engines. They have operated trouble-free and maintenance-free, fitting in exceptionally well with our treatment plant requirements.

"By operating on methane, the sludge gas by-product of sewage treatment, our fuel costs have remained at a minimum. In addition, the Enterprise Dual Fuel 'Select-O-Matic'® feature has given us the flexibility we need when sludge gas production becomes erratic. On either gas or oil the engines respond well to changes in power demands. All in all, these engines provide us the dependable, continuous operation we need with very reasonable manpower requirements."

This and other model sewage plants in such cities as New York, East Boston, Mass., and San Diego, Calif., attest to the fact that complete dependability and economy of municipal operations start with Enterprise Engines.

Engines of Every Type and Size for Every Municipal Need

Enterprise specializes in engines for stationary and portable electric power generation, flood and water pumping systems, and sewage plant power. Versatile fueling is available in diesel, dual fuel and spark ignited gas engines. Models range from 73 to 7703 HP. Call in the Enterprise sales engineer in your area, or contact factory direct for information or help with your plans.

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dependable **ENGINES**

Over a million horsepower at work the world over!

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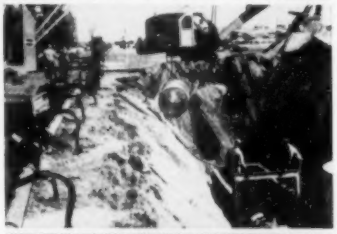
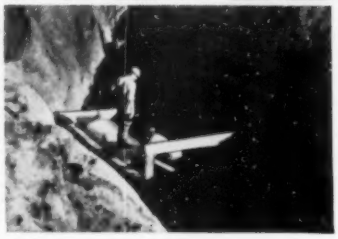
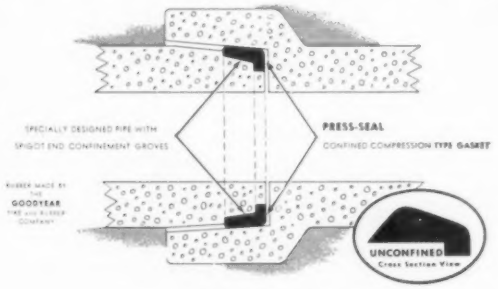
Mt. PLEASANT PROJECT

Selects PRESS-SEAL Rubber Gaskets





Consoer, Townsend and Associates, Consulting Engineers, Chicago, Ill., chose Press-Seal Rubber Gaskets. For years longer, Press-Seal Gaskets will provide a tighter seal in this Mount Pleasant, Michigan, sewer system, where excessive water from underground springs presents a problem. Resident Engineer: Robert Casewell. Construction Contractor: Burr Brothers, Mount Pleasant, Michigan. Concrete pipe furnished by Marsh Monument Company.



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- **Prevents Infiltration**
- **Speeds Installation**
- **Stops Root Problems**
- **Cuts Installation Costs**
- **Reduces Accidents**
- **Permits Pipe-line Contraction and Expansion**

Available in different types of gasket material for every sewerage purpose:
Buna-N for Oil Content Sewage • Neoprene for Acid Content Sewage • Natural Rubber for Common Sewage

More and more engineers throughout the United States and Canada are specifying Press Seal Gaskets.

The lowest cost material item in any Pipe-line Project is a PRESS-SEAL Gasket

Write, Wire or Phone for Complete Information and Specifications

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Look ahead
...*move ahead*
...and stay ahead
with
Allis-Chalmers
crawler tractors

first choice on more and more tough jobs

Four big advantages stand out in the coast-to-coast swing to Allis-Chalmers crawler tractors:

- **outstanding work capacity**
- **real dependability under severe conditions**
- **easy maintenance and lubrication**
- **timesaving, cost-cutting service**

As a result, Allis-Chalmers users bid closer to the belt, set schedules with more confidence, end up "in the black." So before you buy your next tractor, take a close look at *these* machines . . .

There's an extra measure of

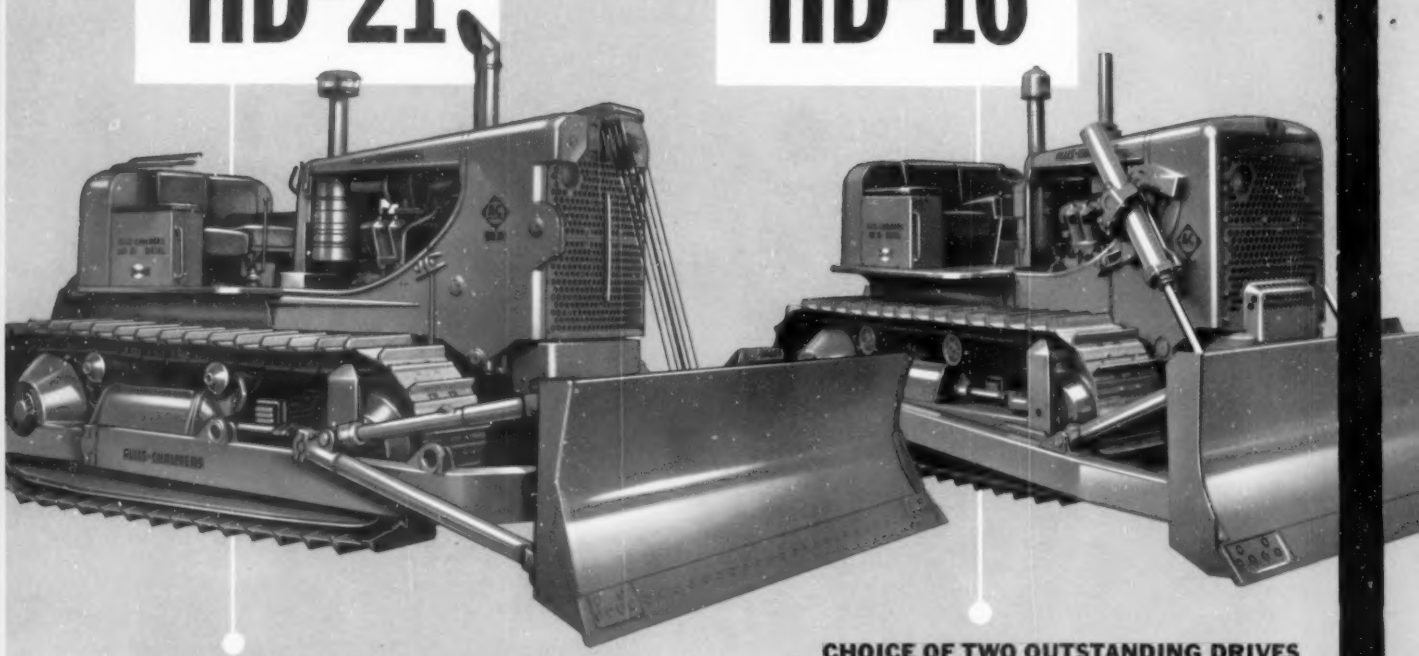
IN EVERY SIZE . . .

ALLIS-CHALMERS

HD-21

ALLIS-CHALMERS

HD-16



225-hp turbocharged engine
Hydraulic torque converter drive
56,260 lb (approx. as shown)

The new HD-21 brings you live power for today's big-tractor jobs—and torque converter drive puts it to work automatically. The HD-21 offers more work capacity—dollar for dollar—than any other big crawler tractor you can buy.

HD-21A illustrated—Two other models available

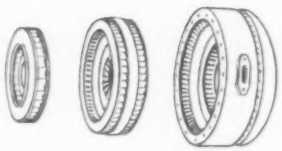
CHOICE OF TWO OUTSTANDING DRIVES

Hydraulic torque converter	All-gear
150 net engine hp	141 belt hp
39,090 lb (approx. as shown)	125 drawbar hp

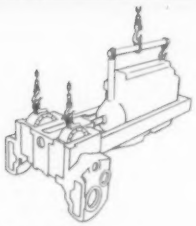
Get up on the HD-16 yourself—and see how it handles jobs ordinarily assigned only to bigger, more expensive crawler tractors. You'll sell yourself—just as more keen-eyed construction men do every day.

HD-16DC illustrated—Five other models available

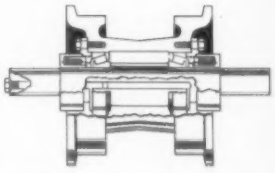
Pioneered and proved by Allis-Chalmers Engineering in Action



Torque Converter Drive gets more work done—automatically provides the right pull or push for every load, at maximum speed for existing conditions. (*Available in HD-21 and HD-16 only.*)



Unit Construction saves valuable time . . . lets you remove any major assembly without disturbing adjacent assemblies.



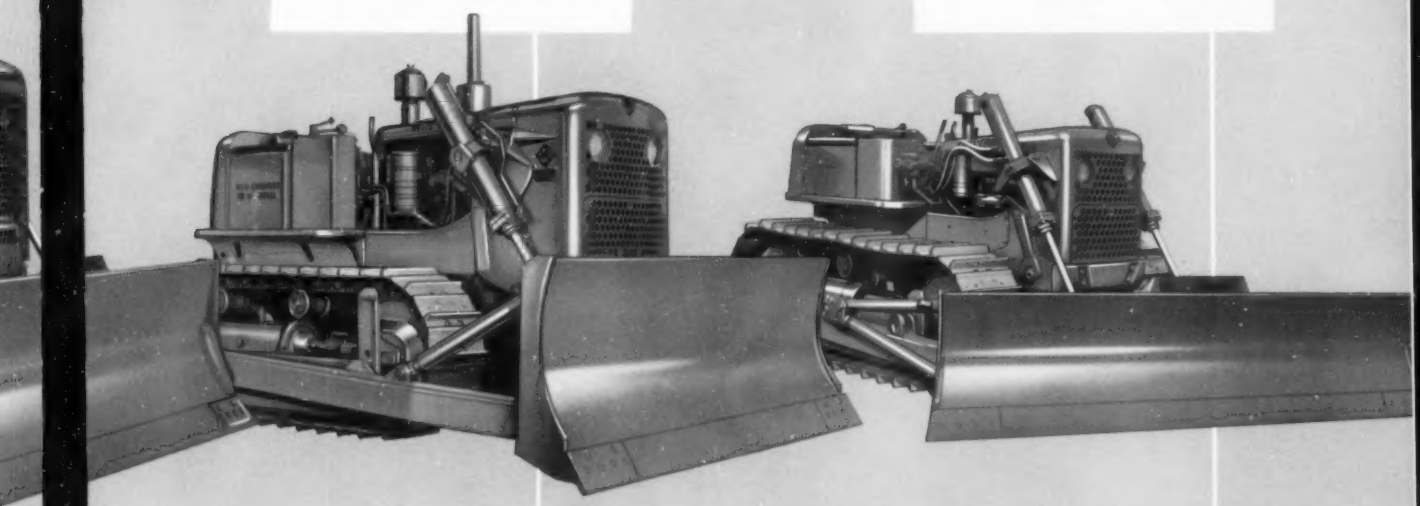
1,000-Hour Lubrication intervals for truck wheels, idlers, support rollers . . . changes daily greasing time into production time.

THE ONLY COMPLETE LINE OF CRAWLER TRACTORS THAT

performance and dependability
. A SIZE FOR EVERY JOB

ALLIS-CHALMERS
HD-11

ALLIS-CHALMERS
HD-6



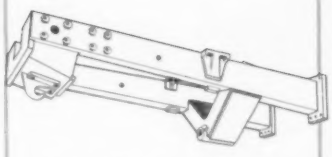
94 belt hp
25,960 lb (approx. as shown)

The HD-11 is setting new standards in its size range . . . offers you dozens of work-boosting advantages, including the industry's easiest shift pattern. A single shift takes it from any forward speed to any reverse—gets short-cycle jobs done faster, easier.
HD-11B illustrated—Two other models available

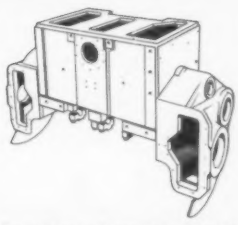
63 belt hp
16,470 lb (approx. as shown)

Here's up to 15,500 lb drawbar pull. The HD-6 is the only tractor near its size with big-tractor design advantages—for example, All-Steel Box-A main frame and engine-mounted dozer with direct-lift cylinders for improved weight distribution, accurate dozing and long life.
HD-6E illustrated—Three other models available

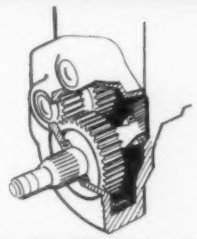
True-Dimension Track heat-treated and machined in the industry's most modern facilities, is setting new track-life records on every type of work.



All-Steel Box-A Main Frame soaks up shock and strain . . . provides improved weight distribution and equipment mounting.



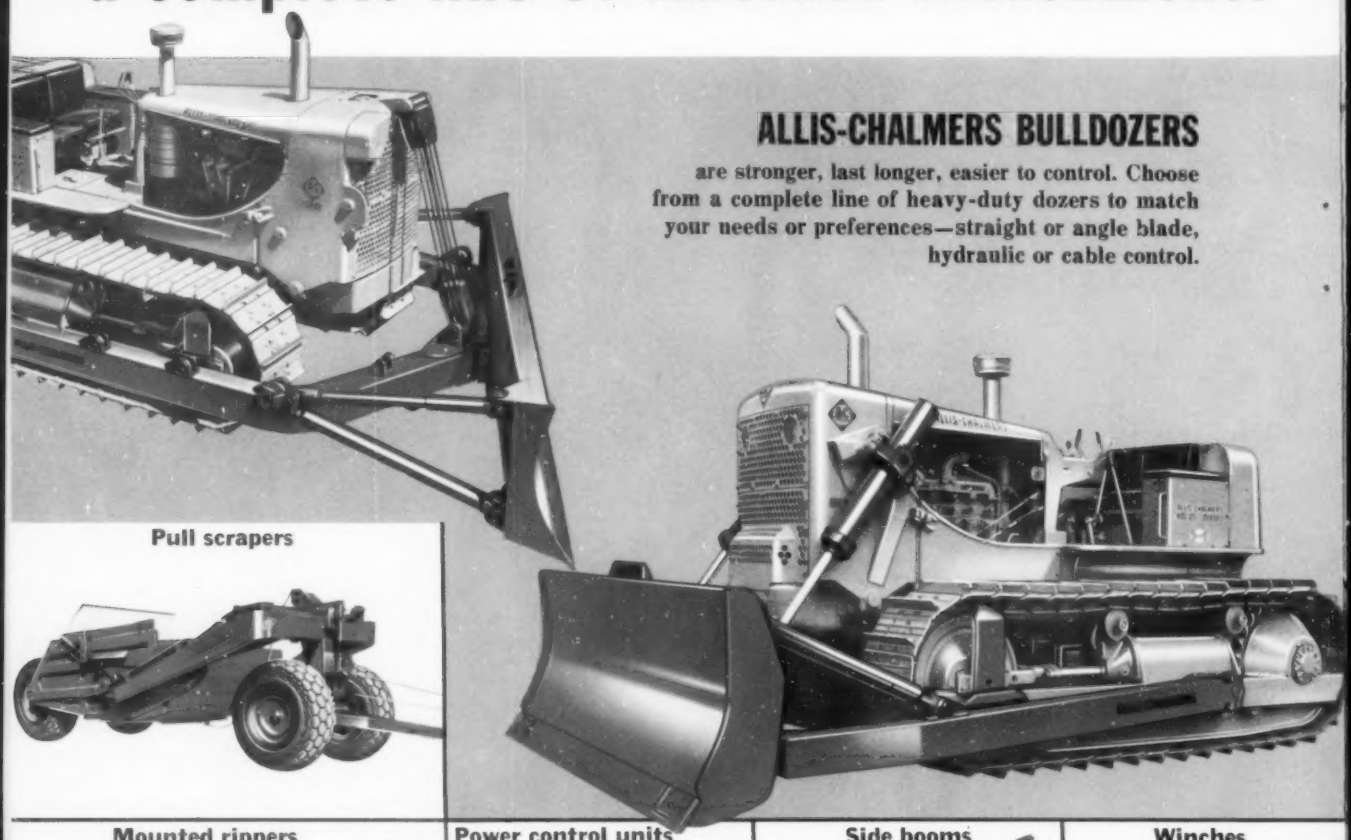
One-Piece Steering Clutch and Final Drive Housing with extreme rigidity and strength . . . line-bored to provide precise alignment of gears and shafts.



Straddle Mounting of All Final Drive Gears with tapered roller bearings on both sides of short, large-diameter shafts . . . provides extra gear life.

GIVES YOU ALL THESE ADVANTAGES IN EVERY SIZE..PLUS

a complete line of matched attachments

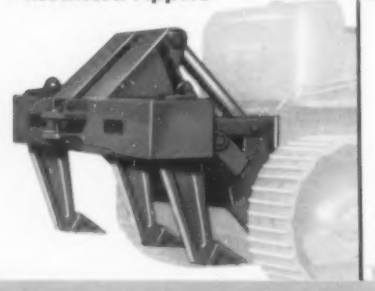


ALLIS-CHALMERS BULLDOZERS

are stronger, last longer, easier to control. Choose from a complete line of heavy-duty dozers to match your needs or preferences—straight or angle blade, hydraulic or cable control.

Pull scrapers

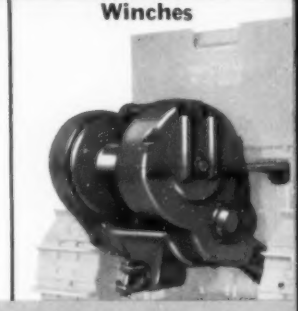
Mounted rippers



Power control units

Side booms

Winches



A demonstration on your job will prove their value . . . call your Allis-Chalmers dealer now.

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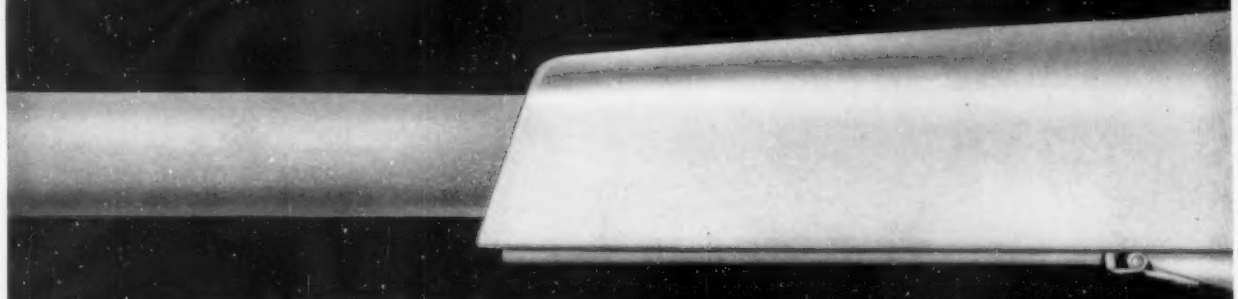
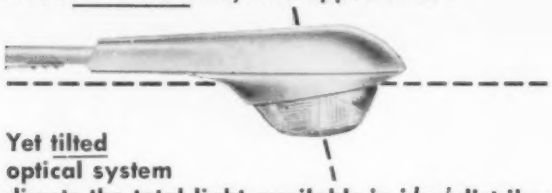


New Westinghouse

OV-25 *Silverliners*

WITH OR WITHOUT A BUILT-IN BALLAST

Sleek horizontal daytime appearance!



Yet tilted optical system directs the total light available in *ideal* distribution patterns. Gives more light per watt than any other comparable luminaire!

A roadway luminaire establishing new standards of design, application and cost-saving is now available from Westinghouse!

This new luminaire is the OV-25 *Silverliner.* It is engineered to virtual optical perfection! With features producing "custom application" of maximum lighting output—for practically all roadway areas requiring high illumination!

A one-piece *die-cast* aluminum housing permits the clean-lined Silverliner styling that heightens community pride—and gives Silverliners an almost unlimited service life!

Silverliner reflectors of Alzak® finished aluminum are contour-engineered precisely for the 400-watt mercury lamp—the most economical lamp for roadway lighting today! These reflectors snap rigidly into the housing in positive alignment!

Silverliner prismatic refractors achieve new excellence in the optimum control of total light output! And their edge overlaps the edge of the reflector—"uniting" the two—and eliminating the trapping and the waste of light that occurs at this juncture in all other designs!

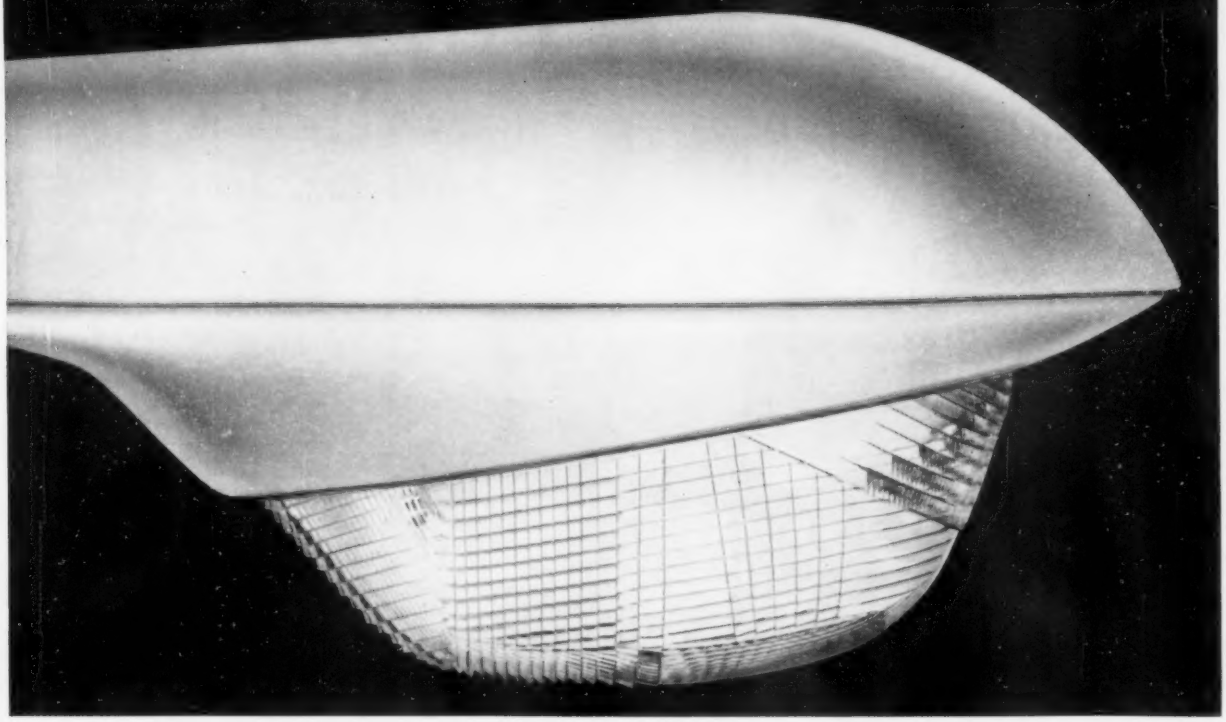
Then the die-cast aluminum refractor ring automatically "locks" the reflector-refractor assembly into precise, tilted optical focus!

Moreover, a resilient seal at the socket-opening, as well as at the reflector-refractor gasket, prevents the entry of bugs, dirt or moisture. The need for cleaning is minimized. As a result, this "double" sealing of Silverliners produces more *maintained* light than is *possible* by other luminaires, with openings around their socket!

Finally, Silverliners give either Type II or Type III distribution. And a simple socket adjustment lets you "toe-in" the beam! You can "custom focus" the light from *each* Silverliner, according to its location!

Silverliners first *deliver* and then *maintain* more light per watt—with optimum roadway coverage—than *any* other 400-watt luminaire available today!

400-WATT LUMINAIRES



Built-in Ballast model saves from $50 to $70 on every Silverliner installed!

With their own dual-voltage regulated output ballasts self-contained, Silverliners eliminate need for:

1—Transformer bases
2—Pole-top fitters
3—Mounting bands
4—All labor for their assembly
5—Often, considerable wire
6—Splicing time and labor

And, all installation and servicing from one ladder-position—*and from below*—creates additional savings!

Silverliner housings are merely mounted level. Tilted optical system alignment is automatic. Only two leads go to the terminal block. Installation time is cut as much as 60 per cent!

Maintenance costs cut up to 30%

The refractor-ring hangs open for easy access to the lamp. It is secure in open position but easily removed. And Silverliners' *completely* sealed optical system can cut the number of cleaning trips in *half!*

Call your Westinghouse Representative TODAY! Get your FREE Silverliner brochure. See, for yourself, the *startling* savings you get with Silverliners!

Or, write directly to Westinghouse Electric Corporation, LIGHTING DIVISION, Edgewater Park, Cleveland, Ohio. J-04461

1947 This first luminaire for horizontal-burning mercury lamps, introduced by Westinghouse, had a one-piece reflector-housing. It excelled at the time; but was discontinued because reflector-housings:

1 Require longer periods atop ladders for servicing. Make maintenance slow and costly!

2 Do not assure a positive seal. Need more frequent cleaning. Have high loss of efficiency!

3 Are easily dented—destroying the optical system and distorting light distribution!

1953 This first luminaire with a cast-aluminum housing and separate reflector was also introduced by Westinghouse. It vastly improved lighting efficiency, gave excellent maintained-light and cut maintenance costs!

1958 **New Silverliners with their tilted optical system now offer you a more modern appearance and increased efficiency. Look for Silverliners to establish new standards for all future roadway illumination!**

YOU CAN BE SURE...IF IT'S

Westinghouse

Suburbia

LOW-COST

complete sewage treatment plant

for 100-2000 population

Imagine it! A complete sewage treatment plant, engineered to follow your own State Department of Health design criteria, installed for substantially less than ordinary plants!

How? Simplicity of design and operation is the key. The SUBURBIA plant consists of an Imhoff tank that combines primary sedimentation and sludge digestion, a trickling filter, and a final sedimentation tank. Aside from the initial lift pump, the only moving part is a free-swinging rotary distributor. It's foolproof . . . ideal for small communities that can't afford high-priced technical operators. And maintenance is practically nil!

Municipal Service Company provides a complete turnkey job. All you or your consulting engineer need do is supply basic design criteria. We take it from there and design, construct—even lease and operate the plant if you wish. You get a tailor-made plant at almost unbelievable savings.

Another thing. The SUBURBIA is portable! In instances where localized treatment facilities are needed and later become unnecessary because of extension of trunk sewer mains connected to centralized treatment works, the SUBURBIA can be relocated with virtually 100 percent salvage of original materials.

For full information on this remarkable complete treatment plant write to the address below for an illustrated brochure.

NOTE: See a working model of the SUBURBIA at our booth at the American Public Works Association Convention in Kansas City from Sept. 28 to Oct. 1.

MUNICIPAL SERVICE COMPANY

4625 Roanoke Parkway, Kansas City 12, Mo.

COMMENTARY on WATER and SEWAGE TREATMENT

An Introduction to Some Controversial Topics

R. S. RANKIN

Consultant, Water and Sewage Treatment

PROBLEMS facing sanitary engineers today in the water and sewage treatment fields are many and varied. Despite the current impression that treatment methods have become so stabilized that variations incident only to adaptation need concern the engineer in the future, it seems inevitable that the ultimate solution of many factors presently unknown will lead to entirely new processes and methods. In this initial presentation a random selection of some of these problems and unknown factors are discussed briefly. It is planned to amplify these topics later in the hope of arousing sufficient interest in this important field eventually to find practical solutions.

It has been stated by engineers in other fields that a sanitary engineer when sizing the important elements in a plant has only to decide upon the flow and the rest becomes a slide rule operation using established factors. There is an element of truth in this statement and it is not without some merit. Standards for both water and sewage treatment plants are established mainly for the ultimate protection of the public, but such standards can conceivably be degraded to the status of handbook factors. Also, if the design of plants is to be governed indefinitely by present established standards, progress would be at a standstill.

In the field of sewage treatment this is well illustrated by the trickling filter, one of the most widely used devices for biologic oxidation. During the past twenty years the standard for permissible loading has been increased tenfold. However, except for improved designs of underdrains and distribution systems, the trickling filter has remained structurally unchanged for over fifty years. Does this mean that there is no possible future development for this time-tested device? A few comparative values may illustrate some of its often overlooked merits.

A high-rate trickling filter 6 ft. deep operating at 15 MGAD requires about half the volume of an activated sludge aeration tank with 6 hr. detention. Also, assuming a settled sewage of 120 mg/L BOD applied to both types, the trickling filter is loaded at 57 lb. BOD per 1000 cu. ft. compared to 30 lb. for the activated sludge plant. Moreover about 50% of the trickling filter volume is inert, being the internal mass of the media, and thus contributes nothing to performance. What would happen if this ineffective volume could be reduced to say 30%? Another point of difference is the time required for oxidation, the trickling filter doing the job in a matter of minutes compared to several hours for the activated sludge.

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When it comes to tastes in their water supply . . . even pleasant tastes . . . your community will thank you most for what you *don't* deliver.

One way to be sure your water is consistently palatable is to rely on daily threshold odor tests and AQUA NUCHAR activated carbon. By prompt detection and effective control, you stop tastes and odors before complaints start.

To assist you in setting up an economical and efficient PALATABILITY program in your plant, call on our experienced field technical service. At no obligation to you, we will be glad to survey your plant and recommend procedures tailored to fit your particular requirements.

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The heavy-duty *72 gpm* hydraulic system has power to spare for toughest digging. Hopto's 180° wrist-action of the backhoe makes handling of rock, broken concrete or blacktop, and frozen soil easy and profitable . . . permits square cornered digging for forms, footings and foundations.

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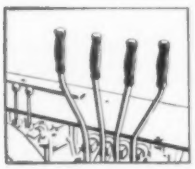

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SAFE, SURE, CUSHIONED CONTROL

Easy to use hydraulic controls are quickly mastered. Hand levers and foot pedals enable operators to combine movements for faster cycling . . . Operation is fatigue-free, *SAFE!*

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Biologists have identified the same type of organisms as responsible for the results in both processes.

One fundamental difference, of course, is that in trickling filters the mass of organisms have substantially unlimited access to the oxygen in the surrounding air whereas in activated sludge there are many obstacles in an aeration tank to the oxygen transfer path. A filter media having the qualities of much greater area per unit of mass would seem a potential field for exploration. Such a media might permit present rates to be trebled or quadrupled. Backwashing might be a necessary and desirable feature.

Another area in the sewage treatment field which still presents many unknowns is in sludge digestion. For example, is there such a thing as high rate digestion which implies a speedup of bacterial processes? Could it be that a better knowledge of the digestion process will prove there is no increase in the rate of bacterial decomposition per se, but that continuity of feeding along with thorough mixing is what produces the superior results? Out of a search for better understanding of the mechanisms of digestion should come an answer to such puzzling problems as the causes of volatile acid production and what remedial measures might be adopted for prevention or cure.

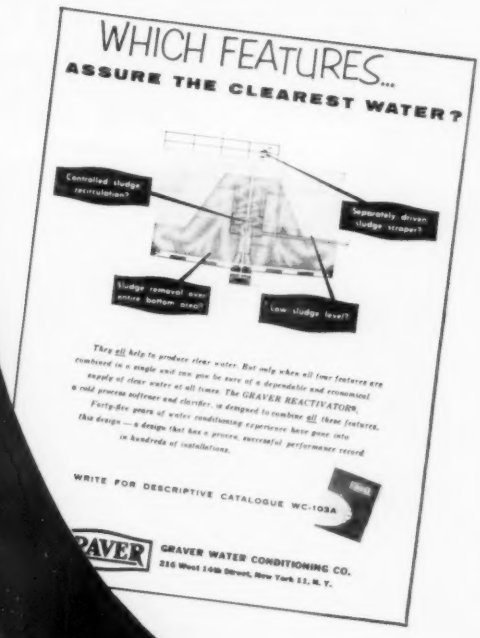
In a related field are the current discussions of sludge thickening ahead of digestion. What are the advantages and disadvantages of such an operation, and what is the overall cost picture? Can it be justified in small plants or only in large plants?

Current methods for disposal of digested sludge include drying on sand beds and dewatering on vacuum filters with no practical alternative except lagooning between these two extremes. An open sludge drying bed filled 8 inches in depth twelve times a year with sludge having 8% solids will dewater in one year 40 lb. of dry solids per square foot. This output can be equalled in one 8-hour day on one square foot of a vacuum filter. Surely there should be some method available to a designer between these two extremes, one requiring a year and the other one day for the same task.

Sewage treatment plant construction costs have been on the increase ever since the depression and it is unlikely there will ever be a material decrease. This fact should encourage the development of methods and processes which minimize these increases and at the same time reduce cost of operation.

Turning to the field of water treatment, it seems that in the not too distant future, engineers are going to be faced with a serious problem. This refers to the effect of radioactive wastes on surface water supplies. The continued increase in the use of radioactive materials not only for weapons but for industrial, medical, and other purposes will inevitably result in an increase in the amount of radioactive wastes in surface waters. Furthermore, it is understood that the permissible tolerance of human beings to radiation is being constantly reduced as time permits more accurate evaluation of data. Surface supplies contaminated by radioactive wastes cannot be economically treated by usual chemical methods to eliminate them except possibly for that portion contained in the turbidity or suspended solids. The question which this condition might pose is whether all surface supplies eventually will require treatment for complete removal of all turbidity.

Another subject of interest is the place in water and sewage treatment for the "package" plant. With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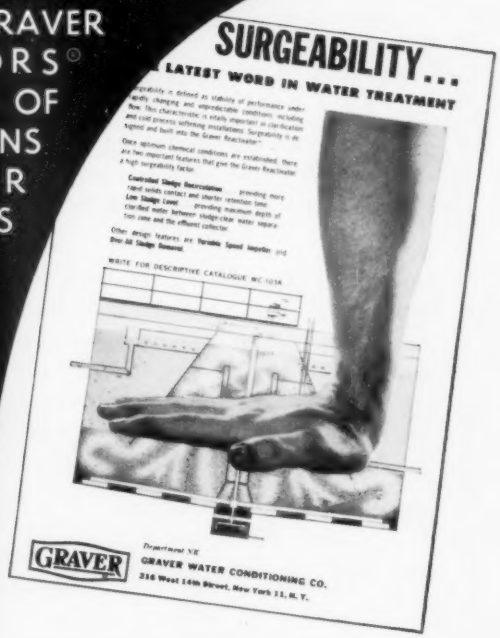
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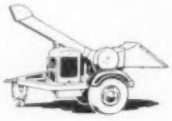
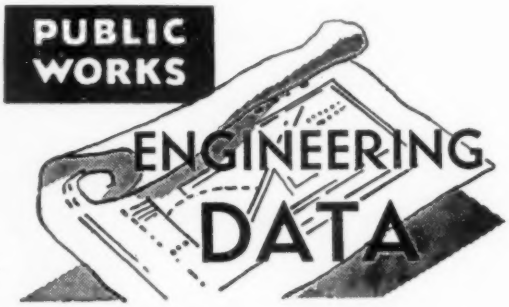
Write *today* for full details. Better—ask for a prompt demonstration without obligation.



ASPLUNDH CHIPPER COMPANY
505 York Road, Jenkintown, Pa.
By Actual Test the Fastest Chipper Made

the unquestioned monetary savings to a user by the purchase of a prefabricated plant, the problem is when and where are they applicable, also where does the consulting engineer fit in. Package plants have come to stay, the same as prefabricated bridges and houses.

These and other topics, some controversial and all informative, it is hoped, will be discussed at greater length in this column in future issues. The reader is invited to comment and to suggest other topics for discussion.



Chicago Has 61 Movable Bridges

There are 61 movable bridges in the City of Chicago, Ill., according to the Department of Public Works; and about 2500 in the whole country, though Chicago has the largest single group. Of the 61, three are out-moded swing bridges; seven are rolling lift type; two are vertical lift; four are single leaf bascule; and 45 are double leaf bascule.

The design of these movable bridges in Chicago, including the mechanical and electrical features, is as modern and advanced as any in the country and reflects more than 50 years of experience on the part of the Division of Bridges and Viaducts, Bureau of Engineering. Stephen J. Michuda is Chief Bridge Engineer.

Garbage Grinders for a Small Community

To compensate for discontinuance of garbage collection service, Lodi, Wisc., a community of 1600, purchased 200 home garbage grinders at a cost of $50 each and resold them to homeowners. Terms provided for repayment on a quarterly basis: installation cost ranged from $6 to $25, mostly depending on the condition of the plumbing.

The sewage treatment plant, more than 20 years old, provides only primary treatment though modernization and the addition of secondary treatment is under way. The existing plant is already overloaded and there is no way to determine the effects of grinding garbage on the plant effluent.

Trenching Rates of Backhoe-Loader

Two New Jersey contractors report trenching 80 to 90 feet an hour in tough soil conditions using a Davis backhoe and loader combination mounted on a Massey-Harris tractor.

Digging in sand, clay and gravel soil, two feet wide, with depths ranging from seven to 12 feet, John Stohl Excavating, of Englishtown, N. J., cut 80 to 90 feet of trench an hour on a straight run. V & H Construction Co., New Brunswick, N. J., made 80 feet of trench an hour, going 3½ to 5½ feet deep through shale and red clay.

Manuel Calvo, operator for V & H, worked his ma-

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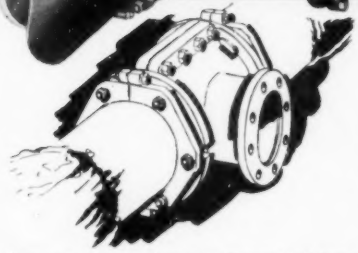
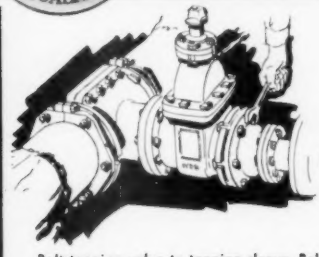
Factories at: Decatur, Chattanooga, Los Angeles,
In Canada: Mueller, Limited, Sarnia, Ontario



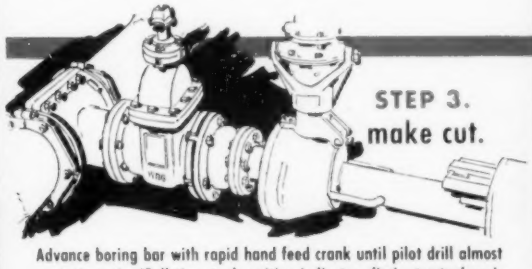
STEP 1. attach sleeve.

Clean main of rust and scale. Position and bolt tapping sleeve to main. Tighten or calk and lead end joints of sleeve.



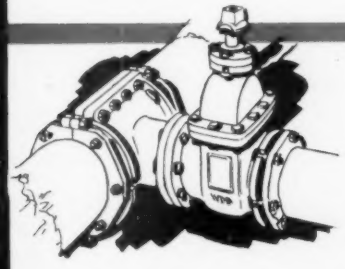
STEP 2. attach valve and CL-12 machine.

Bolt tapping valve to tapping sleeve. Bolt CL-12 Drilling Machine to tapping valve. Open valve all the way.



STEP 3. make cut.

Advance boring bar with rapid hand feed crank until pilot drill almost contacts main. (Full-time tool position indicator eliminates tool position guesswork.) Turn "auto feed set" knob until exact depth of cut required appears on feed travel indicator. Engage automatic feed and make cut. ("CL-12" may be operated by hand or power.) When cut is completed, feed will automatically disengage. Retract boring bar, close valve and remove machine.



STEP 4. make connection.

Slip branch main into valve and tighten or calk and lead joint. Open tapping valve to activate branch main.

INCINERATOR MAINTENANCE CAN BE CUT!

Here is Plibrico's method for reducing costs in two major areas of maintenance expense

THE FURNACE LINING

Greatest potential source of maintenance expense is the lining . . . and you can see why, for it's subjected to the greatest punishment. Temperature fluctuations cause lining expansion and contraction; sudden inrushes of cold air during charging cause thermal shock; and there's abrasion to contend with too. These destructive forces attack an ordinary lining of fire brick where it's weakest . . . in the joints . . . hastening failure.

There are no joints in a Plibrico lining. What's more a Plibrico lining has a positive anchorage system holding it securely in place. Hence that weakness, that cause of premature failure, that source of maintenance expense is eliminated.

THE STOKER

You know the more complex a thing is, the greater are its chances of failure, the more difficult and expensive it is to repair. The Combustikator stoker is simplicity itself. The ruggedly built grate assembly works as a single unit, driven one direction by a motor through simple mechanical linkage, and returned by husky power springs. Nothing complicated, but how effective! That's why it can be your answer to high stoker maintenance. You'll get a bonus saving with the Combustikator, too, for it provides automatic ash discharge, cutting ash handling costs.

May we place all the facts before you?

Plibrico INCINERATORS

1800 KINGSBURY STREET • CHICAGO 14, ILLINOIS

chine in shale by raising one outrigger higher than the other, thus putting the whole machine on an angle. This permitted using the bucket so that one tooth on either corner could be forced into small crevices of the shale to loosen it.

The V & H backhoe and loader is greased every 150 to 200 hours of operation, a half-hour being the average time for the greasing job. Stohl Excavating greases every day with the job requiring about 10 minutes. The V & H unit backfills 250 feet of trench five feet deep and 24 inches wide in two hours by using the bucket in a dozer position.

Synthetic Detergents from An English Viewpoint

Synthetic detergents have been in the English news of late and the following, which appeared in the Journal of the Royal Society of Health, and is slightly condensed here, presents an English viewpoint:

The particular victims of this nuisance, by all accounts, are peaceful country folk in hamlets and villages nestling along the river banks and now left only with memories of erstwhile beauties. Now are gone the reflections of trees and sky, blotted out by two or three feet of seething foam; gone is the delight of angling, for if there were any fish left to catch, float and line would be out of sight; gone is the joy of bathing, for swimming in such suds is out of the question; indeed, constant is the fear for the rescue of any unfortunate who should fall in, for he would disappear completely out of sight. Light winds blow a thick plaster of bubbles on cottage windows to blot out daylight from homes; the family laundry is spoiled on the line, and vegetables and flowers can no longer be grown in gardens because of this imported contamination.

Is this picture of the townsman's latest spoilation of the riverside country overdrawn? How does it come about? Can anything be done about it? All these questions come crowding into any public discussion on the subject.

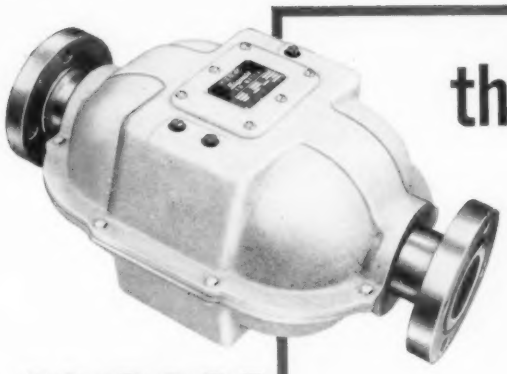
The phenomenal increase in the sale of detergents was due to severe rationing of soap after the last war, to intensive advertising and cut-price coupons, and to their popular merits over soap for many purposes.

Unfortunately most of the synthetic detergents now in use have had adverse effects on purification processes when discharged in sewage to treatment works. To a large extent, these new materials have proved incapable of being destroyed by bacteriological means, nor indeed can they be removed in any alternative way.

The severe problems caused by foam at many sewage works are well known; these have been mainly overcome by anti-foaming chemicals and other means, usually at some considerable cost. Such measures are only palliatives.

The adverse effect on bio-chemical processes is not so obvious, but at one of our largest works where extensive research was carried out on the problem, it was estimated that at least 25 percent more plant would be required to deal with present-day sewage containing synthetic detergents. On such a basis, very many millions of pounds would be required in extensions to the country's sewage works to cover this further gap in our already very overloaded facilities.

The detergent manufacturers would claim that even such an expenditure would be small compared with the value of the sales of these materials—that the average household which spends £5 per annum



the meter with NO flow restrictions

now handling all these difficult liquids

Foxboro's first Magnetic Flow Meter went "on stream" in 1954. Today, this new-type meter has gained industry-wide application for precise, continuous measurement of difficult process liquids.

The Magnetic Flow Meter is installed as simply as a length of pipe. No seals, purges, meter runs, or straightening vanes are required. It connects by standard electric cable to remote Dynalog Electronic Recorder. Over-all accuracy of the system is ±1%. And the meter even measures reversing flows.

With easy-to-measure liquids, or with tough ones like those listed below, the performance-proved Foxboro Magnetic Flow Meter provides flow measurement with no line restrictions. For complete details, write today for Bulletin 20-14B. **The Foxboro Company, 269 Norfolk St., Foxboro, Mass.**

WATER & WASTES

activated sludge
digested sludge
fresh water
primary sludge
raw sewage
return activated sludge

CHEMICALS
ammonium nitrate solution
phosphate slurry
rayon viscose
magnesium carbonate slurry
phosphoric acid slurry
detergent concentrate
rosin size
starch solution
rubber copolymer
liquid latex
soda ash
sulphuric acid
70% sodium hydroxide
soap flow
styrol
magnesium hydrate

FOOD
beer
grape juice
apple juice
pineapple juice
tomato juice
milk
starch slurry
sugar syrup
coffee slurry
molasses

METALS AND MINING
pickling acid
sand slurry
ferrous chloride
limestone shale slurry
bauxite slurry
gilsonite slurry
aluminate liquor
uranium ore slurry
thickener mud
cement slurry
flue dust slurry
acid wastes

OIL INDUSTRIES
drilling mud
phosphoric acid
ethenol extract
scrubber recycle water
urea solution
nitrate solution
spent acid
sodium silicate & water
sodium chloride brine
tar-sand slurry

PULP & PAPER
all types of pulp stock
cooking liquors
spent liquors
bleaching chemicals
lime mud slurries
sizes
alum
dyes

METER SIZES RANGE FROM 3/16 INCH TO OVER 6 FEET PIPE DIAMETER

FOXBORO REG. U.S. PAT. OFF. **MAGNETIC FLOW METERS**

no more knuckle-busting...

New RIDGID 450

Portable Tristand Chain Vise

has Large, Easy-to-Operate

Top Screw Handle

right up on top!

Here's a real time saver. Not only do you get a complete workbench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

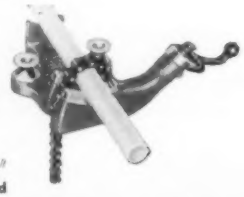
Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

New RIDGID

Bench Chain Vises

have same Extra-Efficient Top-Screw Adjustment.

5 Sizes for ⅛" to 8" Pipe, Conduit or Rod



The Ridge Tool Company, Elyria, Ohio, U.S.A.

on detergents can well afford the relatively small extra cost of dealing with them at the sewage works.

But is money the whole story? Are we not steadily cutting down our margins of safety in being able to purify sewage by bacterial means—particularly in the face of the ever increasing discharge of industrial wastes? And if bacterial means fail what alternative is even remotely conceivable? Above all, since the greater part of these materials are incapable of being removed at the sewage works and therefore pass on to rivers and streams, must we for ever face this new sacrifice of purity and beauty for the sake of the "progress of civilization?"

The addition of anti-foaming chemicals to streams to mask the outward symptoms of this transgression is unthinkable. A logical and final solution would be the production of materials giving the housewife the detergency she wants, but which at the same time could be destroyed and removed at the sewage works. This has been recognized by the first Ministry Committee on Synthetic Detergents which reported in 1956 and by the Standing Committee set up more recently. Can Britain lead the world yet again by a speedy solution of this latest problem?

Roughened Pavement Surfaces at Intersections

A roughened pavement strip 300 feet in advance of stop signs has been used by the Cook Co., Ill., Highway Department at some 75 intersections during the last three years. The roughened surface gives the motorist a slight jolt and produces an audible rumbling sound.

Highway authorities in Cook County report that the use of this device has been very effective in obtaining a greater degree of observance of stop signs. A study of stopping practices of motorists at one of these intersections before and after application of the "rumbler" surface showed that more than three-fourths of the motorists approaching a stop sign at this intersection came to a full stop after the installation of the rough pavement as compared to less than one-half making a full stop prior to its installation.

Before the installation, 3.7 per cent of the motorists did not slow down at all, while after none failed to do so.

Air Conditioning Regulations In Cities

A survey of air-conditioning regulations in various cities has been issued by the Michigan Municipal League based on a survey made by the city of Grand Rapids. The study indicates that the control of non-recirculating air conditioning is a serious problem in many cities. Nearly two-thirds of 159 cities and other jurisdictions reporting described the local situations which affected their approach to the problem. Many cities agreed that a demand charge was the proper means of controlling peak water requirements while providing adequate compensation for the use of water; but most of them felt that a demand charge would not gain wide public acceptance. The major cause for concern was the low diversity factor of air-conditioning operations. During the peak summer months air conditioning units tend to operate during fixed periods of the day without regard to other factors. Because the growth of air conditioning use has been a recent development in most cities, the water systems as originally designed are not capable of handling the peak loading. The report, with tables and appendices on regulations in selected cities, is available from the League, 205 So. State St., Ann Arbor, Mich., at $3.

OLIVER

MODEL 80 HYDRO-TRENCHER

Rough ripping or ticklish digging

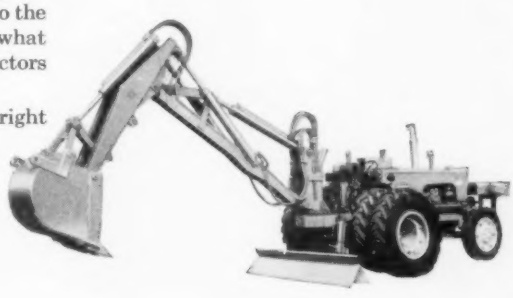
It's all the same to this versatile one-man rig, ready to handle all kinds of excavating and trenching assignments.

Powerful hydraulic pressures give you the ability to rip out pavements or to dig through the toughest soils, even frozen ground. Yet controls are so accurate and sensitive that you can "feel" your way in difficult spots to avoid damage to existing pipes, work close to foundations, etc., with maximum speed and safety.

With its amazing job-ability, the Model 80 Hydro-Trencher gives you rubber-tire mobility to travel anywhere on busy streets, get to the job in a hurry and work fast, achieving lower costs. That's what makes it a real favorite with municipalities, utilities and contractors alike.

Your dependable Oliver distributor will gladly demonstrate right on your own job. Call him today. Or write for literature.

OLIVER Model 80 Hydro-Trencher—available with gas or diesel power, six forward speeds to meet every need for travel and power. Dual hydraulic controls permit raising or lowering bucket while swinging to give you a fast digging cycle. Here's bigger production than you'll get with ordinary equipment of this type.



OLIVER

THE OLIVER CORPORATION

Industrial Division, 19300 Euclid Ave., Cleveland 17, Ohio

a complete line of industrial wheel and crawler tractors and matched allied equipment

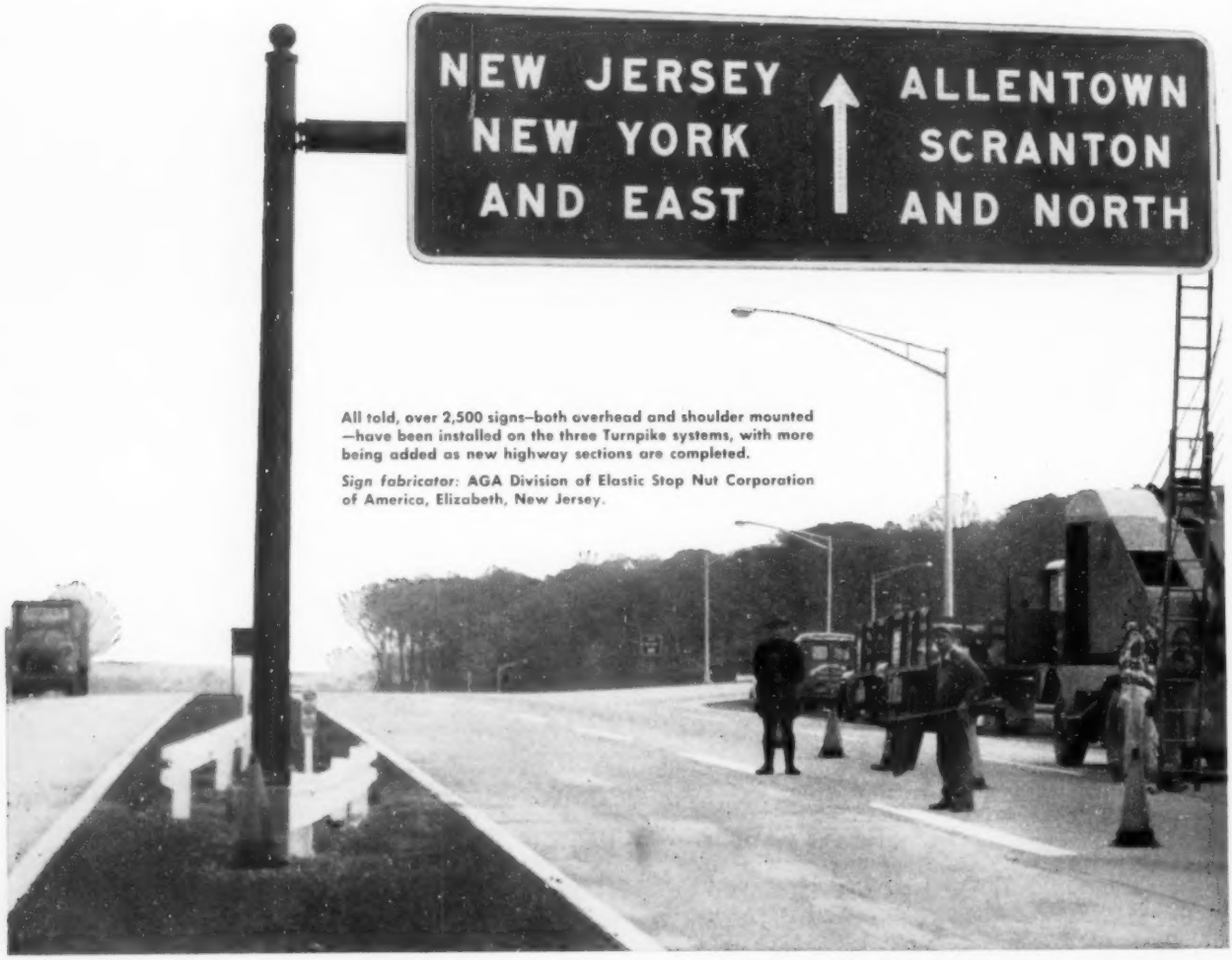
New Jersey Turnpike
New York State Thruway
Pennsylvania Turnpike

Overlaid plywood on the new

KING SIZE OVERLAID PLYWOOD SIGNS take the guesswork out of motoring along the new controlled access highways that speed traffic to and from the busy Eastern metropolitan areas.

Strategically located and reflectorized for nighttime legibility, these bright, easy-to-read signs make the New York Thruway and Pennsylvania and New Jersey Turnpikes a prime example of efficient highway signing. And because they cost less than signs of other materials—both initially and in long-term maintenance—overlaid plywood helps do this better signing job for less money.

Signs of overlaid plywood stand up better under severe weathering, deliberate or accidental abuse. Plywood's strength and stiffness simplifies framing. Standard panels can be easily cut or combined to make signs of any size or design. The durable plastic-like overlay prevents checking, provides an ideal base for paint or reflectorizing.



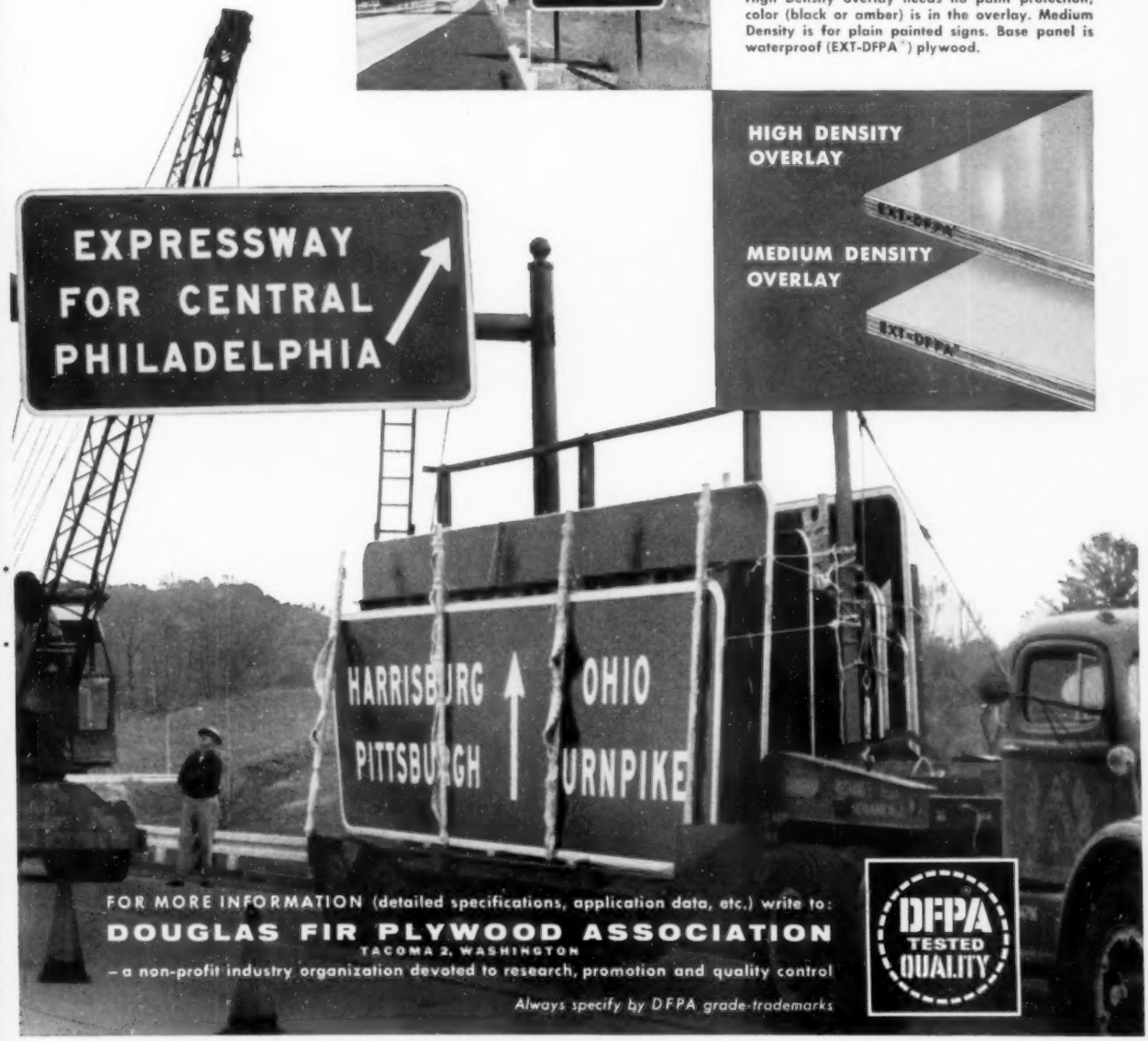
All told, over 2,500 signs—both overhead and shoulder mounted—have been installed on the three Turnpike systems, with more being added as new highway sections are completed.

Sign fabricator: AGA Division of Elastic Stop Nut Corporation of America, Elizabeth, New Jersey.

helps cut signing costs eastern turnpike systems

Overlaid plywood sign panels are stronger, more durable than metal. On shoulder mounted signs, fir plywood's greater stiffness means backing or supporting framework can be eliminated.

Durable overlay eliminates checking, grain raise. High Density overlay needs no paint protection; color (black or amber) is in the overlay. Medium Density is for plain painted signs. Base panel is waterproof (EXT-DFPA*) plywood.



FOR MORE INFORMATION (detailed specifications, application data, etc.) write to:

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

– a non-profit industry organization devoted to research, promotion and quality control

Always specify by DFPA grade-trademarks

DFPA TESTED QUALITY

"I'm Steven Kocur, Superintendent in Town of Carroll, N. Y.

We bought our No. 955 Traxcavator because we knew of Caterpillar's dependability. We've had a minimum of maintenance worries and the operation of the No. 955 is very economical. This machine has saved the township a lot of time, labor and over-all operation costs. It is indispensable to our snow removal work--loading trucks after streets have been plowed. Our streets now are cleaned in record time."

But snow removal is only one part of the story. The No. 955 Traxcavator has proven itself to be an all-year, all-around unit. The township also uses it for loading gravel, building sluices, laying tile, back-filling and maintaining ditches.

The No. 955, which is also used as a crane, recently unloaded 20 tons of bridge material in 30 minutes with an operator and one other man—an operation which once required a full crew working all day.

FIND YOUR CATERPILLAR DEALER IN THE YELLOW PAGES

Somewhere today you have a job that could be done faster and more economically with one of the three sizes of Cat-built Traxcavators. Your Caterpillar Dealer will be glad to show you on *your* job how you can save tax money. And remember, you can always count on him for fast, dependable service and quality parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

YOUR TAX DOLLAR'S BEST BUY

● SUBDIVIDER built the curbs and gutters, with the city responsible for the street lights and hydrants in this subdivision.

Basic Requirements for SUBDIVISION APPROVAL

GEORGE W. CHEADLE,
Div. of Preliminary Engineering,
Dept. of Public Works,
Richmond, Virginia

SUBDIVISION OF land in the Richmond metropolitan area is controlled jointly by the City of Richmond and the Counties of Henrico and Chesterfield. The authority under which this control is authorized includes the State of Virginia Plat Act of 1924, the Charter of the City of Richmond, and various city and county ordinances which specify the manner in which this control is applied.

The State Plat Act provides that the city has joint control with the adjacent counties over all subdivisions within five miles of the city limits. In accordance with this Act the city and the two adjacent counties cooperate to the fullest extent toward exercising this control. Each political subdivision has a separate subdivision ordinance which has been approved by the Council of the city and used by the City Planning Commission in the review of all subdivisions. These ordinances are similar in requirements as to the preparation of plats; however, the control of improvements required in each case is the responsibility of the respective political subdivision.

There has been relatively little development of land within the City of Richmond during the past five years due to the shortage of undeveloped land. The last annexation was in 1942 and since that time the unsubdivided areas have been almost completely utilized. There has been considerable development occurring within the five-mile radius of the city limits.

The subdivision of land within the city is controlled under an ordinance adopted in 1955. This ordinance superseded other ordinances that have been in effect since 1947. Prior to that time the subdivision of land was controlled through the provisions of the State Plat Act itself.

Subdivision Ordinance

The city's subdivision ordinance provides that the City Planning Commission, or its duly authorized representative, shall approve the plat of a subdivision. This ordinance defines a subdivision as: "A division, subdivision or resubdivision of a lot, tract or parcel of land situated wholly or partly within the corporate limits of the city into three or more lots, tracts or parcels of land for the purpose, whether immediate or in the future, of transferring ownership of any one or more of such lots, tracts or parcels of land, or for the purpose of the erection of a building or buildings, or other structure or structures on any one or more of such lots, tracts or parcels of land. The word shall not include a division of land for agricultural purposes in parcels of one acre or more, the average width of which is not less than 150 feet when such division 1) does not require the opening of any new street

PUBLIC WORKS MAGAZINE

VOLUME 89, NUMBER 9
SEPTEMBER, 1958

or the use of any new public easement of access, 2) does not obstruct or is not likely to obstruct natural drainage, 3) does not adversely affect or is not likely to adversely affect the establishment of any expressway, major street, primary highway or toll road, or 4) does not adversely affect the execution or development of any plat or subdivision approved by the Commission or otherwise adversely affect the orderly subdivision of contiguous property."

The ordinance further provides that the City Planning Commission may require subdividers to submit preliminary plans of subdivisions. It has been the policy of the Planning Commission under this provision to require preliminary plans which are reviewed by the Commission in cooperation with the Department of Public Works. Upon the completion of this review the Commission may give tentative approval based on certain conditions, such approval being good for six months. If the conditions are not complied with or the final plat is not submitted within six months, then the tentative approval expires.

Design of Subdivisions

The ordinance also has many requirements pertaining to the design of subdivisions. Some of these basic requirements include:

1) Service roads parallel to expressways or parkways.

2) Where streets do not continue through an intersection, any offset must be at least 150 feet.

3) Street intersections should be as nearly at right angles as possible.

4) Streets whose termini do not permanently connect with other streets shall not exceed 400 feet in length unless, on account of topographical or other conditions, a greater length is desirable. Turnarounds or cul-de-sacs with minimum diameter of 80 feet are required.

5) Widths of streets shall be as shown in the master plan; and in the event the width of any street is not shown, then it shall be not less than 60 feet. The Planning Commission has the right to waive this requirement as well as others if the subdivider can show hardship for various reasons.

6) Street grades on major streets shall not exceed 5 percent and on minor streets shall not exceed 10 percent unless unusual topographic conditions require greater rates for use of the street. Minimum grades of four-tenths of one percent are allowed.

● **EASTVIEW subdivision, a public housing project, complies with the requirements for street signs, streets and alleys; and setbacks are in accord with city ordinances.**

7) Duplication of street names is not allowed.

8) Alleys are required with minimum width of 16 feet allowed.

9) Easements for overhead, surface and underground facilities such as gas utility, water utility, electric utility, sewers and surface drainage are required when necessary. Minimum widths of 12 feet are allowed for easements.

10) Block lengths shall not exceed 1,320 feet nor be less than 400 feet in length between intersecting streets along a street on which the lots front except where topography does not permit it.

11) Lot areas in dwelling districts are established by zoning laws. Minimum lot widths of 50 feet at the building line where practical to connect with a public sewer and 60 feet when it is not practical to connect are required.

12) Lots in dwelling districts shall have an average depth of not less than 100 feet.

13) All lots in dwelling districts shall have frontage on public streets which connect to other existing public streets.

14) Land in the proposed subdivision shown in the master plan as needed for streets, highways and other public ways shall be included in the plat.

The subdivision ordinance includes the following basic requirements for improvements in subdivisions:

1) Monuments shall be installed at the corners of all blocks, angle points, radial points of curves and at all intermediate points along street or boundary lines.

2) The streets and alleys shown on the subdivision plat shall be graded to their full width and length and an all-weather surface placed on the roadway in accordance with standard street and alley specifications of the city.

3) Sidewalks and curbs and gutters shall be installed on both sides of streets shown on subdivision plans, which shall be in accordance with standard sidewalk and curb and gutter specifications of the city.

4) A storm water sewer or drainage system adequate to serve the subdivision and the contributing drainage area in its vicinity shall be installed in accordance with standard storm water drainage system specifications of the city.

5) A water distribution system including fire hydrants adequate to furnish water to consumers in the subdivision and for fire protection therein shall be installed in accordance with the standard water distribution system and fire hydrant specifications of the city.

6) A sanitary sewage disposal system adequate to supply the needs of occupants of lots in the subdivision shall be installed. Whenever no part of the existing sewage disposal system of the city is accessible or it is not practical to connect such sewage disposal system thereto, provision shall be made for the disposal of sanitary sewage through a sewage treatment plant. Septic tanks are allowed where soil conditions will permit.

The cost of providing the above improvements are assessed in accordance with an ordinance pertaining to the issuance of building permits and the extension and improvement of streets, alleys, sidewalks, curbs and gutters, sanitary sewers, storm sewers and water mains in the city. This ordinance basically provides that the city will extend fifty feet of street, sanitary sewers and water mains for each building erected on a site. The cost of any extension over fifty feet will be borne by the developer or builder. The cost of storm drainage is assessed on the basis of one-half to the property owner and one-half to the city. The cost of all curbs and gutters, sidewalks and alleys are assessed against the property owner except along the side of properties for alleys and sidewalks. In the latter case, fifty percent of the cost is assessed against the owner.

Hydrants and Street Lights

The city provides fire hydrants and street lights to subdivisions. One six-inch hydrant within 500 feet of every house is the standard and generally hydrants are located at intersections. Street lights are provided at each intersection with illuminating intensity of the lights governed by the amount of traffic.

The subdivision ordinance requires that all plats of subdivisions shall be prepared by engineers or surveyors authorized to do business in the Commonwealth of Virginia. The plats shall be legibly drawn in black lines with India ink. The dimensions of each street shall be 16 inches by 24 inches. The scale of the plat shall be one inch equal to 100 feet unless otherwise authorized. Two cloth prints and one transparent copy of the plat shall be submitted to the Commission for approval after it has been duly executed and acknowledged by the subdivider. The plat shall contain the following:

a) Boundaries showing the length of its courses and distances to one hundredths of a foot and bearings to half minutes, having been determined by an accurate survey thereof in the field which shall close with an error of closure not exceeding one foot in ten thousand feet.

b) Accurate coordinates of selected or monumental points referred to in the city geodetic survey system in cases where the geodetic control has been completed.

c) The exact location, alinement and width along property lines of all streets, whether opened or not, intersecting or paralleling the boundaries of the subdivision.

d) The exact location and character of all monuments.

e) The exact location, alinement or arrangement of street and alley lines in the subdivision, the names of all streets, the bearing, angles of intersection and width thereof, including their width, along the line of any obliquely intersecting street.

f) The lengths of arcs and radii and tangent bearings.

g) The exact location, alinement or arrangement of all easements provided for use by public service corporations, with a statement of any restrictions or limitations placed on such use.

h) The exact location, alinement or arrangement of all lot lines with their dimensions expressed in feet and hundredths of a foot and with their bearings or angles to half minutes.

i) The tangent distances of all corners when rounded at intersections, except in cases where streets intersect at right angles.

j) All lots shall be numbered with consecutive arabic numerals in each block.

k) All blocks shall be lettered in alphabetical order.

l) In case of resubdivision of lots in any block, the lots shall be numbered with consecutive arabic numerals beginning with the numeral following the highest lot numeral in the block.

m) The exact boundaries of all property to be dedicated for public use, and of all property to be reserved by covenant in deeds for the common use of the occupants of lots in the subdivision or otherwise reserved, with a statement of the purpose for which such covenant or reservation is made or such use is restricted or limited.

n) The exact location, alinement or arrangement of front yard set back lines, unless such lines are prescribed or controlled by the zoning law.

o) The name of the subdivision or section or part thereof, the date, the scale and the name of the engineer or surveyor who prepared the plat.

p) The names and locations of contiguous or adjoining subdivisions and the ownership of other contiguous or adjoining property.

q) The name of the subdivider.

r) The north point with magnetic bearing or if the true meridian is shown the basis for its determination shall be stated.

s) A statement of the engineer or surveyor who prepared the plat certifying that the plat represents, and is based on, a survey made by him or under his direction and supervision; that all monuments shown thereon are actually in place or will be put in place before a date specified by him; that their location and character are truly shown on the plat; and that all of the provisions and requirements of the foregoing articles of this part of this chapter have been observed and fully complied with.

t) A statement to the effect that the subdivision as it appears on the plat, including the dedication of all streets, alleys, easement and other land for public purposes and use is with the free consent and in accordance with the desire of the subdivider and of the trustee or mortgagee, or each of them if more than one, in any deed or other instrumentality, if any, creating a lien on the land in the subdivision, or any part thereof, which shall be signed by the subdivider and trustee or trustees, mortgagee or mortgagees, and shall be duly acknowledged before some officer authorized to take acknowledgements to deeds. All cloth prints and transparent prints shall contain such signatures.

u) A statement of the engineer or surveyor who prepared the plat setting forth the source of title to the land subdivided and the court in which the last conveyance or source of title is recorded. When land in the subdivision was acquired by the subdivider from more than one source of title, the land acquired from each source shall be identified on the plat.

When any and all conditions which may have been imposed by the Commission, as conditions of approval of any preliminary plans or plats have been complied with, and when the Directors of Public Works and Public Utilities have certified in writing to the Commission that all contracts and bonds required under provisions of the utility extension ordinance mentioned above have been properly executed and delivered and are in force and effect, the Commission shall finally approve the subdivision plat. The subdivider must then record the plat in the city court within sixty days from the date the plat is approved, otherwise the approval will expire.

As stated in the beginning, the problem of subdivision control concerns the metropolitan area rather than the city. The trend is toward more uniformity of requirements and application with the subdivider assuming more responsibility for providing the necessary improvements for service to the subdivision.

● **SOUTHMONT Village subdivision, like Eastview, predates the 1955 ordinance, but illustrates one of its requirements — a provision for dead-end turnarounds.**

CITY-INDUSTRY COOPERATION MAKES ADEQUATE WATER SUPPLY POSSIBLE

HOMER HATHAWAY

THERE HAS never been much of a water problem in Everett, Wash., at least not as far as source is concerned. The original supply was acquired by the city in 1916 after the Sultan River Project No. 1 was conceived. This Sultan River supply, with proper development, can provide a potential supply for the City and western Snohomish County of 350 mgd. Thus, the demands of this growing area can be adequately handled for many years to come.

But another problem came to a climax in 1954 with the city and its biggest consumers—Scott Paper Company and the Weyerhauser Timber Company's sulphite mill. These mills use about five times as much water as the rest of the customers combined. And the price they were paying for water was considerably lower than that paid by other customers.

The problem had many angles, all of which had to be diligently studied if a satisfactory, long-range solution were to be found. One thing was certain, the rate of $7.50 per million gallons being paid by the two industrial plants could no longer continue. The rate did not cover the total cost of delivery to the two mills, and a depreciation fund could not be built up to provide for eventual replacement of transmission lines which were deteriorating.

Biggest roadblock was a contract already in existence between the city and the mills which did not expire until the 1960's. The mills wished to maintain this favorable rate as long as possible and the Everett City Commissioners certainly did not want to do anything to upset the industrial picture of the community.

John W. Cunningham and Associates of Portland, Oregon, were retained as consulting engineers, to work with the financial advisors of the city, William P. Harper and Sons and Company of Seattle. After several meetings, the city and its advisors embarked on a project to re-negotiate the pulp mill contracts.

First and most important point was showing the companies, with facts and figures, that their own supply of water was actually in jeopardy because of badly needed transmission line maintenance repairs which the City could not accomplish because of insufficient income from its water supply.

The pulp mills made a thorough investigation of the existing pipe conditions and examined the City's Water Department accounts. These conclusions were the same as the city—that it could not afford to make the necessary repairs at the current water rate.

With these basic points mutually agreed upon, a period of negotiation was begun for the purpose of establishing terms, conditions and costs of the new contracts. The result was a 25-year water service contract between the pulp mills and the City of Everett at approximately twice the water revenue to the City as that previously obtained.

Pertinent features of the contracts:

The terms and conditions of the contracts with both pulp mills are identical except for the quantities of water to be delivered:

Scott Paper Company: The City agrees to furnish up to 67 mgd. Actual usage at present is about 63 mgd. Weyerhauser Timber Company sulphite mill: The City agrees to furnish up to 29 mgd. Present usage is around 27 mgd.

The city does not guarantee water quality but agrees to exercise care and diligence to maintain high water quality.

An interim rate of $14.50 per million gallons was paid by the pulp mills to the City for all water purchased between June 1, 1957 and the issuance and sale of $3,850,000 Water Revenue Bonds.

Payment for water after the Revenue Bonds were sold was according to the following schedule:

1. Demand charge: A minimum

● **RIG DEVISED by Al Hyde to transport pipe to point of installation on trestle across Snohomish River flats includes tow carriages straddling the 48-inch pipe.**

● **PIPE line starts up a hill after crossing beneath a state highway.**

monthly charge of $8 per million gallons for 90 million gallons multiplied by the number of calendar days in the month. This charge is payable regardless of the quantity used as long as the water is available;

2. Commodity charge: A charge of $7 per million gallons of water delivered during the month up to an average of 90 mgd.

3. Excess charge: A charge of $15 per million gallons for all water delivered during the month in excess of an average of 90 mgd.

All water sold to the pulp mills is metered within 2 percent accuracy through meters checked for accuracy each 90 days.

The demand charge is adjustable up to $8.80 per million gallons so that 84 percent of the annual debt service on all outstanding Water Revenue Bonds is derived from the demand charge. The commodity charge is adjustable every three years in the amount of 60 percent increase or decrease of local union wage scales for journeymen carpenters, plumbers, pipefitters and common labor, as compared to the wage scales in effect at the time of signing the contract.

If any other industrial customer is given a lower rate than the pulp mills, the mills automatically receive this lower rate.

The mills paid the City a retroactive rate of $7 per million gallons for water delivered between July 1, 1956, and to June 1, 1957, in addition to the $7.50 per million gallons paid during this period. This amounted to about $208,000, which was earmarked to repair the existing pipeline trestle across the Snohomish River flats and to cement-mortar-line about 6700 ft. of 48-in. steel pipe of the No. 2 transmission line.

The City agrees to sell the bonds by December 31, 1959, to finance the construction of Sultan River Project No. 4 (these were actually sold in October, 1957).

This project, as set forth in the contract, consists of the following items: A 52-inch line from tunnel No. 2 to the Panther Creek screenhouse; 48-in. line from the screenhouse to Cavalero's Corner; 48-in. line from Cavalero's Corner to west bank of Snohomish River; a cross town line from Snohomish River to the Everett distribution reservoirs; and rehabilitation of the line and trestle for the No. 2 transmission line.

The city agrees not to divert funds obtained from the water system to support any other service except monies transferred to the general fund in lieu of taxes which is regarded as an operational expense.

Water Revenue Bonds

In October, 1957, the city issued the Water Revenue Bonds after negotiating a contract at an effective interest rate of 4.26 percent, for the financing of the No. 4 Project. An upper limit of $4,500,000 was established for the bonds, with $650,000 of bonds authorized and not yet sold, but which may be sold on a parity with the $3,850,000 already issued. This anticipates that the final cost of the project might exceed the original issue.

The Tax Commission of Washington State has ruled that if certain conditions are complied with in regard to the use and handling of water revenues for bond redemption purposes, these revenues may be exempt from the 3.6 percent public utility tax imposed on the city's water revenues. These conditions are: 1) A special or extra fixed charge for the express purpose of creating a reserve fund for the retirement of utility bonds must be authorized by ordinance or resolution by the municipality; 2) revenues so derived are to be separately accounted for on the books of the city and not mixed with other funds; and 3) income so received must be used exclusively for the retirement of revenue bonds and no other purpose.

The city of Everett is saving over $9000 a year in taxes by adhering strictly to these rules.

Details of Project No. 4

The purpose of the Sultan River Project No. 4 is to add a nominal 50-mgd transmission line from the outlet tunnel of Lake Chaplain to the distribution reservoirs within the city limits. Work involved is as follows:

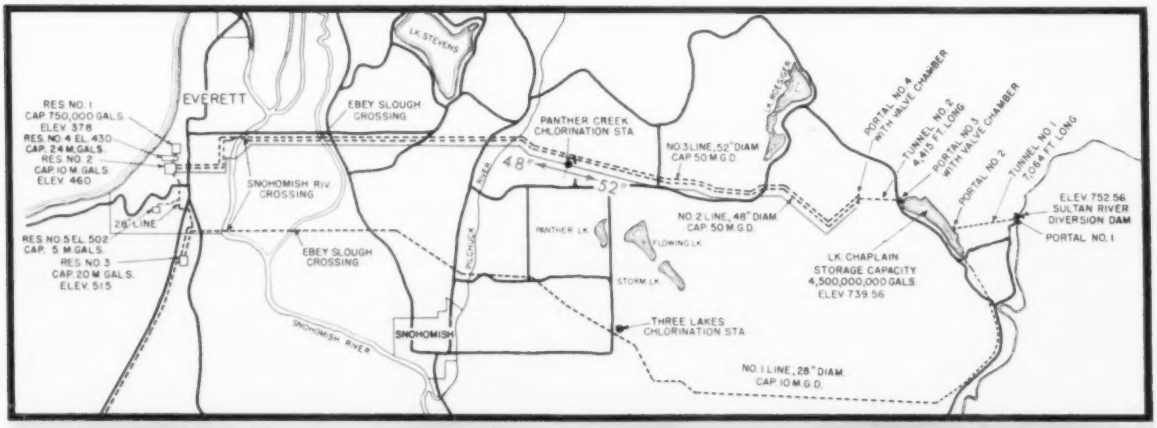
1) Modification of Portal 4 structure (end of the outlet tunnel from Lake Chaplain) to accommodate the new 52-in. transmission line at that point.

2) Installation of approximately 38,500 feet of 52-in. transmission line together with air valves, blow-off valves, and appurtenances between Portal 4 and the Panther Creek screenhouse.

3) Modification to existing Panther Creek screenhouse to enable the 50 mgd additional flow to be properly screened and chlorinated.

4) Installation of approx. 29,000 feet of 48-in. transmission line

(*Continued on page 220*)



● **NEW NO. 4 transmission line is shown in red on location map above. This involves about 38,500 feet of 52-inch line and 29,000 feet of 48-inch, along with some changes in appurtenant structures to deliver about 50 mgd additional supply.**

ERECTION and MAINTENANCE of GUARD RAIL

STEEL BEAM guard rail are used exclusively by the State of Michigan on new installation work, except that some cable and post type railing, being removed from expressways in the Detroit area is being re-used on secondary roads in the suburban and rural areas. All new railing purchased by the state is the steel-beam plate type which is made by several companies that follow the state specifications. Quite a little galvanized railing which requires less painting than other steel railing is also being specified.

Railing is being used on expressways where there is a narrow median strip, such as on the Lodge and Ford Expressways in Detroit, and at places where roadways are on a fill with a drop-off beyond the shoulders. Michigan is generally quite level so that the need for guard rail is not as great as in some states with mountain areas.

Both full pressure treated wood posts and steel posts are used. Power augers generally are used by contractors for preparing holes for the wood posts and power hammers to drive steel posts. Occasionally in rural areas hand shovels are used for digging post holes.

Guard rail is maintained by the county organizations which handle regular road maintenance. In Michigan, there are 17 counties in which the state has its own maintenance organizations. In the other 66 counties, the county road commissions do the work for the state under contract.

In the fiscal year 1956-7, $265,564 was spent for repair of damage done to guard rail. For installing steel beam plate railing the construction costs have been running $2.55 a lineal foot, and for post and cable rail the price is $2.25 a lineal foot.

Detroit District Engineer, C. H. Brown, says there are many spots where the beam type railing is damaged, yet no accidents were reported for that particular spot. This indicates that this type of railing is doing a good job of saving lives and preventing damage.

Prior to the use of railing on the Detroit Expressway median, cars and trucks were hitting vehicles coming in the opposite direction. The guard rail, which is double faced, has one set of railing, facing one roadway and the other facing the opposite roadway, with one set of posts holding both plates.

Photos courtesy Michigan State Highway Dep't

● **STEEL beam guard rail is used exclusively on new installations, the specifications providing a type that is made by several companies. Quite a little galvanized railing is used. Some cable type removed from expressways is used elsewhere in the state.**

● **POSTS are either full-treated wood or steel. Power augers are generally used by contractors for making holes for wood posts and power hammers to drive steel posts.**

● **GUARD railing is being used on expressways having a narrow median strip, as on Lodge and Ford Expressways in Detroit; and on fills with dropoff at the shoulders.**

VARIABLE SPEED for SEWAGE PUMPS

R. H. DEURER,
Public Works Department,
Worthington Corporation

IN DESIGNING sewage pumping stations careful consideration must be given to the variation of flow rates between night time minimum and morning maximums. Seasonal dry and wet weather conditions further affect the rate of flow, with storm conditions upsetting the normal predictions at any time. In addition to the variation of capacity, the head which the lift pumps must operate against is to a great extent dependent upon the quantity of flow. Variable speed centrifugal pumps will meet these wide and sometimes unpredictable variations, without the addition of special units to handle the extreme conditions. By closely matching pumping rates with incoming flow rates, wet-well storage requirements are reduced. Pumps operating over a range of conditions, rather than at a particular point, can reduce the number of units required.

In systems relying on combinations of constant speed pumps in parallel, undesirable surges occur as additional units are put on the line. Variable speed units, possibly in combination with constant speed units, eliminate surges by making pumping capacity available in smaller increments.

The number and type of variable speed units and whether or not they are paralleled with constant speed units is a problem of economics. Added cost of variable speed units is offset by reduced pump station size and reduction in the number of pumping units.

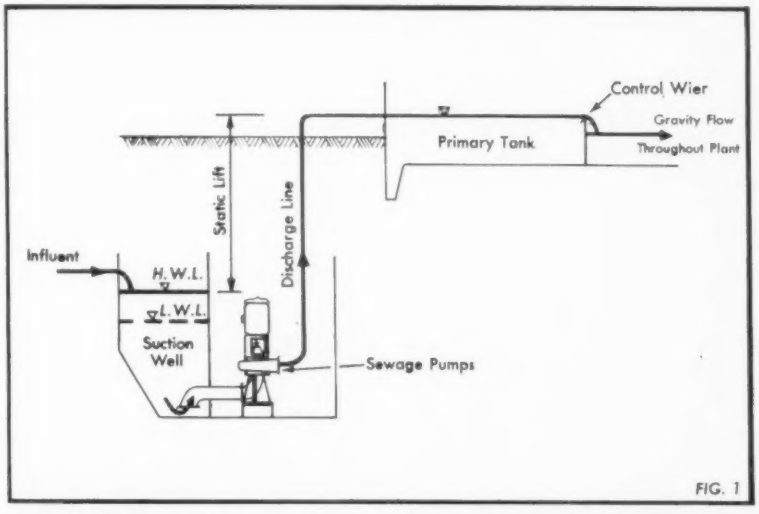
A station system head curve is the result of two components, capacity and head, as shown in Fig. 2. Capacity is simply the quantity passing through the system while head includes static lift and line losses. Static lift is a relatively constant figure depending on the variation in suction and discharge well levels. Raw sewage pumps frequently discharge into the primary tank where the level is constant, as in Fig. 1. Line losses include pipe friction, losses through valves and other fittings, etc. These losses are roughly proportional to the square of the quantity being pumped.

The performance of centrifugal pumps at varying speeds obey certain relations which make their application to rising system heads advantageous. The capacity (Q) for a given set of conditions varies directly with the speed (n), while the head (H) varies as the square, and the horsepower (P) varies as the cube of the speed.

Applying centrifugal pump characteristics to a sewage station system head seldom requires speed reduction greater than 20 percent. Note in Fig. 2 that, to reduce the capacity of one pump by 50 percent on the system head, the speed is only reduced about 17 percent. This relation depends on the slope of the pump and system head curves. The pump should be selected with a flat efficiency curve for maximum efficiency over its operating range.

How To Vary Pump Speed

It was a relatively simple matter to adjust the speed of earlier steam engine driven sewage pumps. The advent of the AC induction motor as the major driver of sewage pumps introduced many advantages but was limited to single speed operation. This limitation in conjunction with other industrial requirements resulted in the development of variable speed arrangements by both electrical and mechanical means. As the horsepower requirements vary with the speed, centrifugal pump drive is a varying torque application and can be handled by any variable torque driver.



● **SCHEMATIC profile of a typical raw sewage lift pump installation. The head which the pumps must generate is made up of static lift and line losses. Capacity of the suction well, number of pumps used and control depends on the rate of inflow.**

Modern Speed Controls

Multi-speed motors are a compromise between constant and variable speed drives. They are actually two or more induction motors wound into the same frame, each approaching the characteristics of the corresponding constant speed motor. Reduced speed operation is not penalized by extreme loss in driver efficiency. Operation is limited to full load synchronous speeds which do not always correspond to pump requirements. On sewage pump applications this speed limitation is probably the most important disadvantage of multi-speed motors. Multi-speed motors are available in

the same horsepower range as constant speed motors for both horizontal and vertical installations.

Independent starting equipment is required for each speed wound into the motor. A two-speed motor complete with starting equipment will cost about one and one-half times as much as a corresponding constant speed motor.

The **wound rotor** or **slip ring** motor is the most widely used variable speed driver of sewage pumps. Speed is controlled by varying the amount of resistance in the secondary windings of the motor. There are several types of secondary controller used to introduce the resistance either uniformly or in fixed increments. The latter method results in stepped speed variations, while the first method gives an infinite number of steps or uniform speed control. Both control arrangements can reduce speed approximately 50 percent and are flexible enough to handle the majority of sewage pumping applications. The nearer stepless speed variation is approached, the more expensive will be the control equipment. In addition to variable speed operation, wound rotor motors are often used because of their advantageous starting characteristics. They can develop 100 percent starting torque with the KVA inrush not exceeding 150 percent of full load values.

Wound rotor motors for both horizontal and vertical application are available in the same sizes as constant speed motors. The efficiency varies approximately in direct proportion with the percent of speed reduction.

A wound rotor motor complete with an adequate secondary controller will cost one and one-half to two times as much as the corresponding constant speed motor.

The **eddy current** or **magnetic slip coupling** is particularly well suited for variable speed pump operation where very close control is required.

A magnetic drive consists of a constant speed motor, either synchronous or induction, driving a ring element which electro-magnetically transmits torque to a magnet attached to the pump shaft through an air gap between the ring and the magnet. (Fig. 3). Control equipment varies the intensity of the magnet, which in turn controls the amount of "slip" between the two elements.

Slip losses are dissipated in the form of heat by either water or air cooling. In the speed ranges applied to sewage pump drive, the efficiency of the magnetic slip coupling and its driving motor vary approximately in direct proportion to the amount of speed reduction.

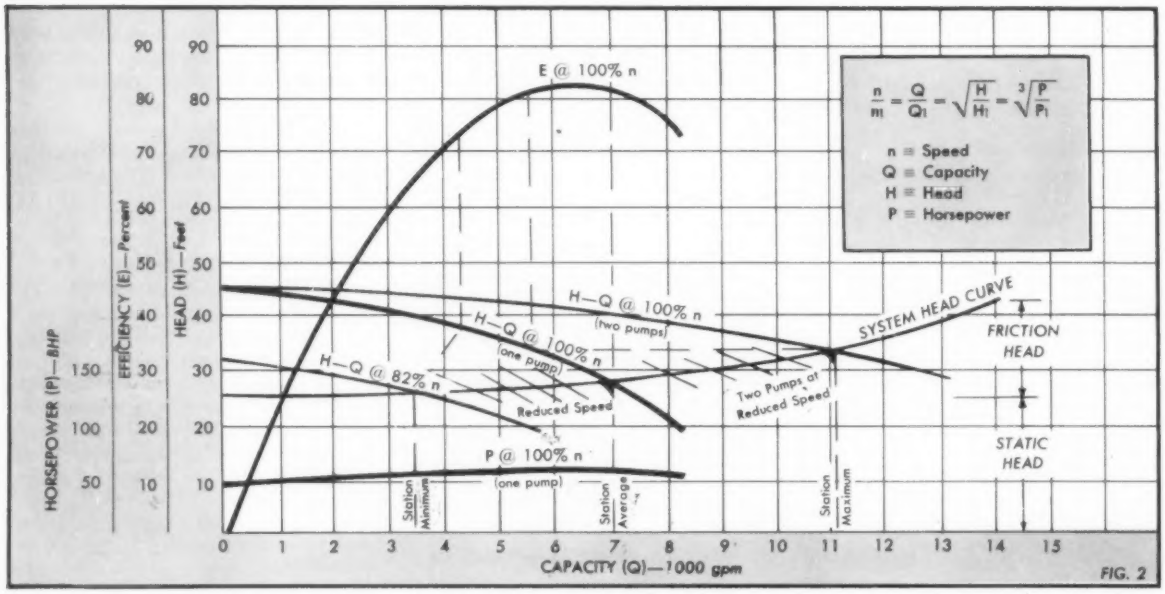
A magnetic drive will give precise speed control within ±0.5 percent down to about 15 percent of full speed. These variations are stepless so that incoming flow rates can be exactly matched. Suction well levels can thus be maintained within extremely close limits where desirable.

The driving motor operates at a constant speed and can be started under no load conditions. The load is gradually engaged by energizing the magnetic drive. On high horsepower, low speed applications, the efficiency and power factor advantages of synchronous motors can be utilized.

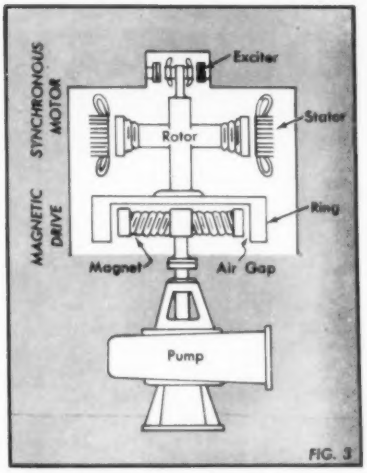
Magnetic drives are available for both horizontal and vertical installations in sizes large enough to handle any sewage application. A magnetic drive complete with its driving motor and variable speed control will cost from two to three times as much as the corresponding constant speed drive. In the case of low speed applications, substantial savings can be realized by using higher speed motors and magnetic drives with a reduction gear between the pump and the magnetic drive.

Variable speed transmissions utilizing a constant speed motor in conjunction with variable pitch sheaves and belts are used to drive sewage pumps. The mechanical ratio between the sheave diameter is adjusted to vary the output speed. (Fig. 4.)

Vari-Speed transmissions offer precise stepless speed control with relatively constant efficiency down to about 10 percent of full speed. This type of drive is available up to 60 HP and is best suited for horizontal installation. It is particularly well suited for driving miscellaneous circulation and balance pumps where the horsepower is relatively



● **TYPICAL system head curve of capacity plotted against total head. Variable speed pump performance is predicted by plotting pump curve on the system head curve. In this case one variable speed 12-in. pump handles capacities between station minimum and average. Flows in excess of this are handled by two variable speed pumps operating in parallel. See text on page 103.**



● **MAGNETIC drive furnished by the Electric Machinery Co. has constant speed synchronous motor connected to the pump through a magnetic coupling.**

low and horizontal units are suitable. Within its horsepower limitation the mechanical variable speed transmission is probably the most economical stepless variable speed driver.

Internal combustion engines have proven reliable and versatile as drivers of sewage pumps. They insure a dependable source of power particularly in areas subject to loss of electrical power. In addition to pump drive, engines are largely used in sewage treatment plants in conjunction with generator and blowers.

A variety of types of engines and fuels including gasoline, diesel oil, sewage gas and natural gas as well as combinations of the latter three as dual and tri-fuel engines are available. Horsepower, speed and fuel availability determine the type of engine selected.

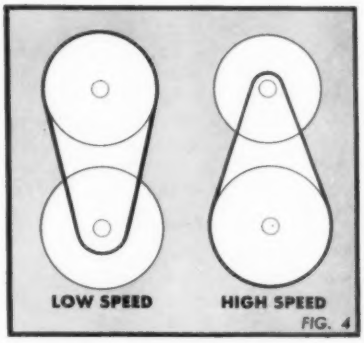
In sewage treatment plants, a major source of fuel is the gaseous product of anerobic digestion. This gas is largely methane with a heating value between 600 and 900 BTU per cubic foot. Gas output normally ranges between .60 and 1.00 cu. ft. per capita depending on the type of sewage treatment. When the sewage gas supply is intermittent or limited, combination dual or tri-fuel engines are used. These engines burn either oil, sewage gas or a combination of the two. It is a relatively simple matter to vary engine speed to control pumping rate. Prolonged operation at reduced loads and operation at critical vibrational speeds must be avoided. Within these limitations, varying engine speed is an effective method of adjusting pumping capacity.

Engines are available in almost unlimited ratings but are best suited for horizontal shaft drive. Vertical pumps require right angle gears between the pump and engine. These gears can include speed ratios so that both pump and engine can be selected for the best operating speeds.

A cost comparison is almost impossible due to the variety of types of engines available and the choices of accessory equipment.

In addition to variable speed operation, fuel cost and dependability for standby operation must be evaluated when considering engine driven sewage pumps. The use of the once wasted sewage gas as fuel may often justify engine driven pumps.

In addition to the variable speed drives mentioned, there are numerous other types which, within their individual limitations, can be and have been applied to sewage pump drives. Variable frequency, fluid couplings, steam turbine and brush lift motors are a few examples. Some DC motors are still in use.



● **LOW AND HIGH speed positions of the belt in the Worthington Corp. Vari Speed transmission, showing how easily mechanical ratio can be varied.**

Automatic Control

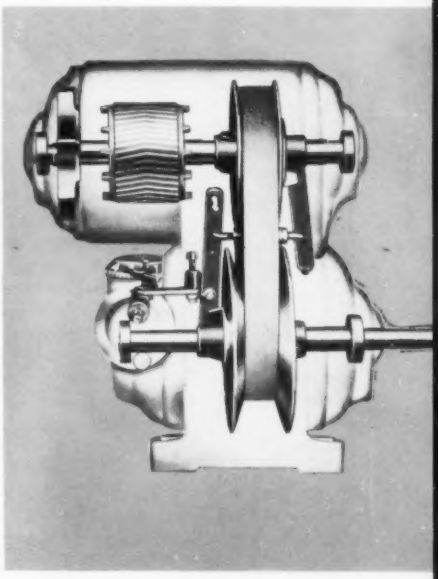
All the mentioned drivers are applicable to automatic control. Normally pumpage is controlled by a rising or falling wet well level. Mechanical, pneumatic and electrical sensing devices, through the driver controls, convert the changing wet well level into variable driver speed. Generally speaking, the closer the well levels are to be maintained the more elaborate will be the driver and control apparatus. It is not uncommon to control well levels closely enough to maintain downstream heads on various pieces of equipment such as comminutors.

Control systems are available which "recycle" sets of pumps. This arrangement exactly matches pumpage with incoming flow rate and is best suited for controlling stepless variable speed drivers such as the magnetic slip coupling. As the first variable speed pump approaches full speed and the well level continues to rise, a second pump is brought on at half speed and the first pump is reduced to half speed. The two units then increase in speed together as long as the well continues to rise. With falling well levels, the procedure is reversed.

Conclusion

The performance characteristics of variable speed centrifugal pumps are readily applied to the rising slope of system head curves. In determining the type of variable speed driver to be used, degree of control is a prime consideration. Particular horsepower ranges are more advantageous than others to certain types of drivers. Cost and efficiency comparisons given are general in nature and may vary greatly between applications. In the case of engines, the availability and economy of various fuels must also be considered. In addition to advantages derived from closely matching pumpage with inflow rates, higher unit costs are offset by smaller suction well structures and a reduction in the number of units required.

The excellent performance records being compiled by variable speed pumping stations indicate increased future use of this type of driver.



● **PHANTOM view of the variable pitch sheaves and belt in the Vari Speed transmission. See also Figure 4.**

CURB, GUTTER and SIDEWALK Repair Program

DUFFY ATKINSON,
Director of Public Works,
Glendora, California

THE HISTORY of the City of Glendora, Calif., from the days of the old Spanish land grants is as interesting as any TV western. It is now a thriving community of 16,000 people situated in the northeast section of the San Gabriel Valley some twenty miles east of downtown Los Angeles.

Back in 1887 a visionary real estate developer named George Whitcomb lined the streets of the new town with 6,000 fast growing California pepper trees. For several years the developers watered the trees by hauling barrels of precious water from the mountain springs to each tree — quite a maintenance problem in itself. Today many of these peppers are still standing and each one doing its share of sidewalk upheaval. We can't deny that the citizens of Glendora have enjoyed the beauty and shade of the grand old pepper trees for many years and a considerable amount of the city's money is still being spent in the general care of the trees to keep them alive and safe for a few years yet to come. However, the problem of maintaining sidewalks and curbs is no less a major one as a result of the ever expanding root systems of the big trees.

The City is solving the problem of sidewalk and curb maintenance by setting up a crew of three men who work year-round on this job. We justify this small crew's continuous operation rather than a major removal and big volume operation by the fact that the areas demanding attention are generally small and in locations throughout the city. It is not uncommon to find only a square or two of sidewalk in an entire city block requiring attention; therefore, a big operation might be spread out over a square mile of the town which would require considerably more supervision and create more complex problems in protecting open and freshly poured areas.

Our concrete repair crew accomplishes two main objectives; the first involves the elimination of hazardous cracks for the protection of pedestrians, thus avoiding damage suits; and second is effective public relations.

The work is conducted in the following manner: The crew is made up of one finisher who is classified as a maintenance man II, or lead man, and two helpers classified as maintenance men I. The equipment consists of one two-ton dump truck, a quarter-yard cement mixer, wood forms, membrane cure tank and small tools. On tough breakout jobs the crew has access to pneumatic equipment and a skip-loader, but for most general repair work we find that the limited equipment does the job. This is unique in that public works projects usually require much more extensive equipment.

The Procedure

The operation starts initially by a field survey by one of the engineering personnel who lists the streets requiring attention. The survey is made as required, usually once a month unless complaints from citizens point out areas demanding immediate investigation. We concentrate our work on one street until completed. This plan aids in the coordination of the work and, what is more important, the citizens and the men doing the work may more readily see the progress being made.

Upon receipt of the survey the three men go to work. On Monday they break out the broken or cracked sections of the walk or curb and load the truck. They break out enough to provide for a day's pour on the following day, thus reducing the amount of open walk requiring barricades and lights. The concrete breaks readily with a sledge, an operation which certainly meets with more approval by the citizens in the early morning hours than the use of pneumatic pavement breakers. We also note that the hand breaking and loading procedure tends to limit removal to the actual broken sections rather than attempting to maneuver a skip-loader along the parkways, uprooting and breaking pavement not requiring repair. Also, the hand operation affords greater protection to the grass and shrubs in the parkway and on private property. The day's "break-out" has been set at approximately five cubic yards of concrete which generally amounts to a half a day's pour the following day. This has been found to be a suitable quantity because it constitutes one transit-mix load of concrete or approximately 405 square feet of sidewalk which is a convenient area to finish within the time allotted. The first half of the second day is spent pouring and finishing; the crew completes the day's work pulling forms, cleaning-up and making small patches requiring a limited quantity of concrete that is mixed in the quarter-yard mixer. It is important to note that this four-hour operation is carried on near the locality of the larger pour in order that the men may prevent individuals from disfiguring the newly poured concrete.

On Wednesday and Thursday the crew repeats the Monday and Tuesday operation.

On Friday the concrete crew joins the tree crew in removing some of the old pepper trees that have been condemned. At this date only 500 of the original 6,000 trees that Mr. Whitcomb planted still exist. Wherever these trees interfere with the curb or sidewalk we attempt to cut away the roots to provide room for the concrete work. However, every effort is made to protect the trees wherever possible.

Cost of Construction

Accurate cost records indicate that the three-man patch operation costs the city 48¢ psf., which includes the breaking out and disposal of the broken concrete and the repour as follows: Three men break out, dispose of material, grade and form—24 hrs.; place and finish five yards of ready-mix concrete—12 hrs.; and remove forms and miscellaneous small work and clean-up—12 hrs. This makes a total of 48 hrs. of working time. The cost

break down is as follows: Forty-eight man hours at $2 per hour= $96; 5 yards concrete @ $10=$50; and equipment time—24 hrs. @ $2= $48. The total cost figures to be $194.

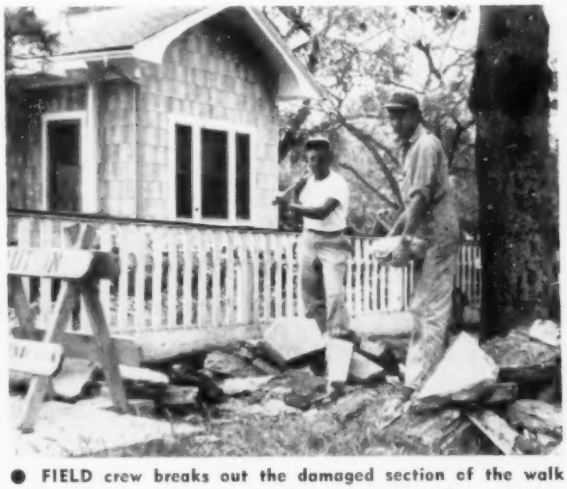
Five cubic yards are needed for an area of 405 square feet; accordingly, the work is costing 48¢ psf. In addition, the crews patch cracks and small danger spots which is an additional service not reflected in the 48¢ price.

Financial justification for the expenditure of city funds for repairing sidewalks and curbs involves public relations, responsibility in tort liability, overall public policy and finances available.

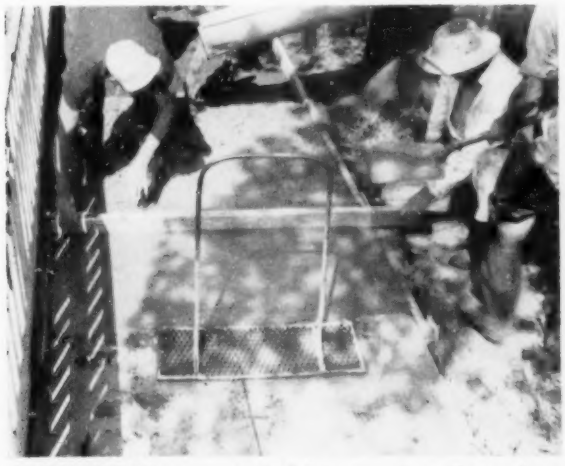
General tax revenues are used for the costs of general structure of the government and for ordinary maintenance of public improvement and works. At what point the repair of sidewalks and curbs cease to be termed "ordinary maintenance" and become "reconstruction," demanding other methods of financing such as special assessment districts, is a difficult question. One point is quite apparent, however, and that is the increasing responsibility to which the cities are being subjected in tort liability. Therefore, it appears reasonable to be conscious at all times of the demands for an active sidewalk maintenance program even though it represents a considerable drain on the general revenues. Through an active sidewalk repair program the people seem to be stimulated by the city's interest and attention and often begin re-seeding parkways, edging grass, and generally are more interested in maintaining their property. Our three-man crew is busy all of the time and is being watched by the critical eyes of citizens. Occasionally the crew members are stopped to discuss a particular curb or sidewalk problem with the property owner, thus presenting an excellent public relations opportunity: first, to show the taxpayer that the city crews really do produce; and second, they can see "concrete" evidence of the proper expenditure of their tax dollar.

● **TYPICAL of what is happening to Glendora's sidewalks in this view of a cracked and heaved area near a tree.**

● **FIRST step is a field survey by engineering department personnel. This is followed by work of a 3-man repair crew.**



● **FIELD crew breaks out the damaged section of the walk and excavates to prepare for its replacement the next day.**



● **TRANSIT-Mix concrete is being poured as the workmen start tamping and screeding. Daily pour is about 5 yards.**

● **FINISHING the job. This shows the troweling and marking operations. Average cost of the work is 48 cents per sq. ft.**

RIGHT-OF-WAY FENCING ALONG A TURNPIKE

FENCING FOR the right-of-way of the New Jersey Turnpike and its two extensions, a distance of 131.5 miles, is provided on both sides for practically its full length. In barren meadowlands or at stream crossings there is no fencing, or at bridges where the fence is connected to abutments. The transformer enclosures, radio towers, and maintenance areas are enclosed with fencing. A total of approximately 1,400,000 feet of fencing of several types was utilized, which is the equivalent overall of 265 miles. The fencing was designed to be economical and provide a minimum of maintenance.

Basically, three types of fence were used to meet local conditions, to offer maximum safety to motorists and truckers on the Turnpike, and for the protection of those residing in the areas along its route.

Farm field fence with a large mesh at the top and a smaller mesh at the bottom, four feet in height, was installed in rural areas to keep pedestrians and farm animals from getting on the Turnpike right-of-way; four-foot chain link fence, with two-inch square mesh, was installed in more populated areas to protect pedestrians and small animals; and seven-foot chain link fence, generally with barbed wire at the top, was placed in densely populated areas to prevent animals and pedestrians, particularly children, from getting onto the Turnpike.

Approximately 1,275,000 feet of four-foot farm field fence was installed; more than 100,000 feet of seven-foot chain link fence with barbed wire on the top; and about 30,000 feet of four-foot chain link fence.

Including the Newark Bay-Hudson County extension, and the Pennsylvania Turnpike connection, the overall cost of fencing the Turnpike involved a total of slightly more than $1,300,000. The work was awarded to eight contractors, covering both materials and erection.

Maintenance costs since erection of the original fence in 1950 have been nominal, totaling only $5,461 in 1957. During that year, incidentally, measures were taken to close all openings at the bottom edges to prevent domestic animals from entering the highway. And, where necessary, some minor repairs were made at points where the fence was damaged. All of the maintenance is handled by the Authority's own force and includes labor as well as materials and equipment.

● **NEW JERSEY Turnpike required 265 miles of fencing. Three types of fencing were used: Farm field fence; 4-ft. chain link; and 7-ft. chain link with barbed wire top. This picture shows the jobs of driving fence line posts and unrolling wire mesh.**

The chain link fence used in the original 118-mile Turnpike installation is woven of #9 gauge (0.148 inch) galvanized steel wire, with top and bottom selvages having a twisted and barbed finish. This fence is four feet and seven feet in height. The tension wire at the top and bottom was #7 gauge (0.177 inch) galvanized steel fence wire. On the two extensions, which have since been constructed, a heavier type of galvanizing is being used, 2.4 ounces per square foot of chain link wire surface.

Posts, braces, tie rods and stretcher bars were of commercial quality steel. All posts were topped with malleable iron caps. Posts for the seven-foot chain link fence were equipped with extension arms to provide for installation of three lines of barbed wire along the top. Fittings were of pressed or rolled steel, forged steel, cast steel or malleable iron. All ferrous materials entering into the fence were galvanized.

Contractors were required to clear the area of brush or undergrowth along the line of fencing. This clearing had to be done in a manner to leave intact valuable trees and selected native growth. If any question arose as to alignment of the fence, or any engineering problems developed during construction, the final decision was left to the consulting engineers for the Authority who were in charge of the various sections.

The fence was set a nominal distance of three inches above the ground line. However, over irregular ground a maximum clearance of six inches above the ground was permitted for a distance not to exceed eight feet. Fence posts are spaced not farther than ten feet apart with tolerance of a minimum of two feet either way. Additional posts were spaced at shorter distances for changes in grade. All posts were set in concrete.

Line posts were secured by drive angles below ground. At all changes in grade or alignment, pull posts set in concrete were provided to permit construction of a taut fence. Such pull posts were set at 500-foot intervals along straight runs of fence.

● FLEET of five Mobil motor sweepers at County Highway garage. In addition to these, dump trucks, tractor brooms and leaf suckers are used in sweeping program.

STREET SWEEPING OPERATIONS ON COUNTY ROADS

DAN J. MURRAY,
Highway Maintenance Supt.,
Essex County, N. J.

THE STREET sweeping operations of the Essex County Highway Department requires 13 pieces of equipment and 9 employees.

The list of equipment used to keep the roads and streets clean is as follows: five Mobil motor sweepers with dual controls and dual gutter brooms; two dump trucks with 4 yds. capacity; two tractor push brooms that push leaves into piles; two leaf suction machines that are skid-mounted on dump trucks; one electric broom making machine; and one car used by the foreman for making inspections and laying out schedules.

The following personnel is used to operate the equipment: one Foreman; three sweeper operators; two truck operators; and four laborers.

All leaf machines, used in the fall of the year, are manned by extra personnel furnished by main headquarters.

Minor repairs and maintenance are done by the motor sweeper operators, such as greasing, changing oil, changing brooms, making brooms (both rear brooms and gutter brooms) and broom adjustments. Major repairs are done by the repair shop at the main headquarters.

There are three motor sweepers working on scheduled routes; two sweepers working nights—2:00 AM to 10:00 AM; one sweeper working days—8:00 AM to 4:30 PM.

The County is divided into six night routes and four day routes. Night routes are numbered from 1 to 6—three routes on the Northern section of the County and three routes on the Southern section. One motor sweeper is assigned to Routes 2, 4 and 6, Northern section, and sweeps these routes in succession. The routes in the Southern section are numbered 1, 3 and 5, and are also swept in succession. If there is a break in the sweeping schedule caused by rain, a holiday or a weekend the operator continues on the last scheduled route. These routes cover from 35 to 40 miles (curb sweeping miles) each.

The day routes numbered from 1 to 4, are taken care of by one motor sweeper. They are not run successively, but by assigned days and time. These routes average from 12 to 15 miles each.

● CLOSE-UP of one of the sweepers. Last year, 13,902 curb miles were swept. A yield of 0.34 cu. yd. of dirt was obtained per sweeping mile; cost was $5.03 per mile.

Disposal of Litter

These motor sweepers, both night and day, as they become loaded, dump the litter and dirt at any safe and convenient location. After finishing their respective routes they report back to the garage. The operator makes a written report as to number of dumps and locations. A

dump truck is then assigned to the route to pick up dumped material. After the truck crew picks up the dump they clean corners at intersections, depressed catch basin tops and large pieces of debris that the sweepers could not pick up. This truck crew consists of a driver and two laborers.

The litter picked up by the truck is taken to one of several assigned dumps and disposed of. All dumping ground is within approximately 15 miles from points at which the litter is picked up.

The material used in rear brooms is Calabar; approximately 115 pounds of material are used per broom. Under normal sweeping conditions, each broom averages between 400 and 500 sweeping miles, at a cost of approximately five cents per curb sweeping mile for rear brooms.

A medium steel is used for gutter brooms and mileage per broom is approximately 300 miles. These brooms, both rear and gutter, are made up by the day operator and truck crews on rainy days.

At the present time, Tynex, a DuPont nylon material, has been mounted on both night sweepers rear brooms. These brooms at the present time are being tested as to mileage and sweeping ability. An accurate count of sweeping miles is being kept, and a later report will follow as to the result. One of these brooms, made with 130 pounds of material has swept 610 curb miles and worn off about 2 inches.

Last year's sweeping costs are as follows: Labor $44,343; sweepers and trucks $25,638; curb miles swept 13,902; cu. yds. dirt 4,791; cu. yds. per sweeping mile 0.34; labor cost per sweeping mile $3.19; sweeper and truck cost per sweeping mile $1.84; and labor, sweeper and truck cost per cu. yd. $14.61.

● **BROOM shop; Calabar is used on rear brooms, but Tynex is being tried out. Medium steel is used for the gutter brooms.**

● **MINOR repairs and maintenance are responsibility of the operators but major repairs are performed at headquarters shop.**

OUR DOWNTOWN PARKING GARAGE HANDLED 142,313 CARS IN NINE MONTHS

JAMES W. FEDERHART,
City Traffic Engineer,
Saginaw, Michigan

THE NEW downtown parking ramp or garage for the City of Saginaw, Mich., started operation in July, 1957. In the nine months through the end of April, 1958, 142,313 cars were taken off the street and parked in the ramp owned by this city of 100,000.

This ramp is only one block from the main business block in the downtown section. As such, it is primarily for short time shoppers, although about 60 monthly parking spaces have been rented.

The parking structure occupies almost a complete city block with only a 120-ft. x 142-ft. rectangle missing from the total block of 240-ft. x 365-ft. size. The building is of a continuous ramp design of three stories. In this design, drivers park their own cars on both sides of a continuous, gently sloping ramp. There are 639 spaces provided and marked in the garage with no blocking of aisleways. An automatic elevator is provided for patrons.

The structure cost a total of $991,952 excluding land, of which $152,009 was for 40 to 80-ft. concrete pilings and $49,597 was for architect's fees. A $1,000,000 revenue bond issue was sold, pledging all returns from the structure, street parking meters, and other City parking lots, for the retirement of the bonds.

Operation of the Ramp

The ramp is operated by full time City employees who are members of the Traffic Engineering Division. It is open Monday through Saturday from 7:45 AM until midnight. This means that two six-day eight-hour shifts are worked by the employees. On each shift there is a woman

Photos courtesy Saginaw Police Dept.

● **GARAGE is three stories high, of continuous ramp design and has a floor area of about 70,000 square feet, providing 639 spaces without blocking any aisle space.**

cashier and a male attendant or ramp supervisor. The cashier stays in the booth at the exit where cars leaving the ramp stop and pay their fee. The attendant or supervisor directs traffic; keeps records; runs the small power sweeper and does other cleaning duties, mans the second cashier's booth during rush hours; and does general work or supervision.

It is possible to operate this ramp with only four employees (two on each shift) because automatic "ticket spitters" are used at each of the two entrances to pass out automatically time-stamped tickets to each entering driver, and each driver then parks his own car. The only time a city employee is involved in the parking or unparking operation is when the driver pays his fee to the cashier upon leaving, or the male attendant does some traffic direction to assist drivers during rush hours.

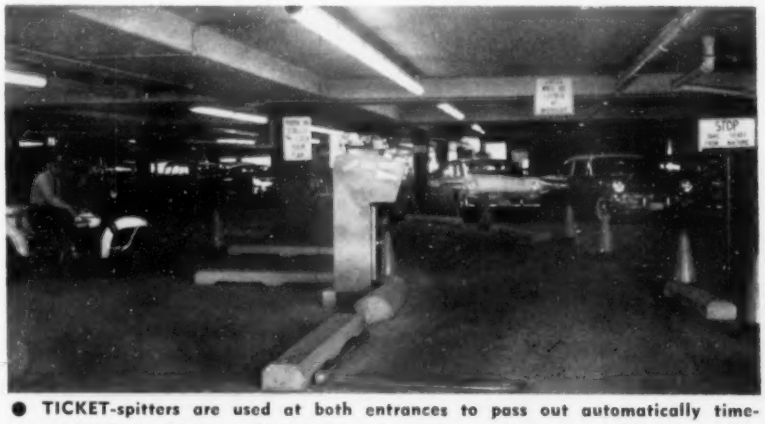
During the Christmas rush period, or on Saturdays or night-shopping nights, occasional help has been used for traffic direction inside the ramp. This sporadic demand has been met by calling for volunteers from other Traffic Engineering personnel who work when needed for hourly wages over and above their regular salaries. This has been a very flexible arrangement and highly successful since always there has been enough people who wanted to earn a little extra money on their own off time. During the Christmas rush, these people were also used during regular working hours when needed, since this is a slack period in their regular pavement marking and traffic sign duties.

Snow Removal

During the recent winter, snow proved no problem on the top, open deck. Usually the bad snow storms occurred when parking demands were not heavy in the downtown area and therefore the covered two floors of the ramp were more than adequate to handle the demand. By the time the space on the top or open level was needed, the snow was usually melted. At times, however, the snow had to be removed because of anticipated parking demand. This was handled by regular City Parks Department employees who have a number of Jeep snow plows and larger trucks. These Jeeps plowed the top deck and stockpiled the snow around four different snow chutes. The trucks would back onto the sidewalks outside, below the snow chutes. The plows would then push the snow into the chutes and trucks for disposal. This was usually done in the early morning hours so no vehicles were in the ramp or traffic or pedestrians on the street.

The ramp and its operation has initiated many favorable comments from the parking public and businessmen in the downtown area of Saginaw. C. A. Miller is City Manager; Spence Brothers of Saginaw, were General Contractors; Raymond Concrete Pile Corporation of New York placed all piles; Ramp Buildings Corporation of New York were traffic and parking consultants on the ramp; and Frederick E. Wigen and Associates, of Saginaw, were the architects.

● **LOOKING down from halfway between first and second floors, showing interior appearance and construction. Note clearances and space for parking and moving cars.**



● **TICKET-spitters are used at both entrances to pass out automatically time-stamped tickets; drivers park their own cars and pay the fee to cashier at leaving.**

MUNICIPAL INCINERATOR TRENDS

R. F. STERNITZKE
Morse Boulger Destructor Company, New York City

A MODERN municipal incinerator bears little resemblance to its predecessor of a quarter century ago. The majority of the changes represent step by step evolution, but there have also been some overnight strides in improvement. Can you remember the work required on the incinerator of the thirties that was charged by hand and manually stoked; and where the ashes had to be pulled into a wheelbarrow before being dumped into a truck outside the building? These incinerators had large refractory hearth areas for burning the wet garbage and small cast iron grate areas for final burning of the refuse. When auxiliary fuel was necessary, coal was added on the grate.

Now, all this has been changed. Modern incinerator plants have storage bins, and the units are charged by means of a crane and bucket; charging and ash gates are mechanically operated; stoking is mechanical and continuous; and operations between floors are coordinated by telephone or loudspeakers. Today's incinerator plant has good natural light and ventilation, lunchroom and locker-room facilities for the operating personnel and plain but pleasing landscaping and architectural treatment.

Among the several factors that have influenced the design of municipal incinerators is the change in the refuse. Frozen and canned foods along with paper and cardboard packaging have greatly reduced the amount of garbage in the refuse. The refuse per capita has increased in volume, weight and BTU value. This has dictated changing the ratio of hearth to grate area as well as making other modifications. Rising labor costs have demanded an increase in mechanization and automation so that more work can be accomplished with less personnel.

The Binghamton Incinerator

An example of these trends is to be seen in the modern municipal incinerator completed last year for the industrial city of Binghamton, N. Y., which incorporates a number of interesting developments. The city dump at Stow Flats was rapidly being filled in, but provided an ideal location for the new incinerator. The site, consisting of 75 acres behind the east bank dike of the Chenango River, is within three-quarters of a mile of the central business district. Minimum collection costs are assured because of this central location, and the low adjacent areas will be able to receive the incinerator residue for many years. Not only has the nuisance of the dump been eliminated, but the city administration also plans ultimately to develop the area into a recreational center.

The three-story brick and concrete incinerator building faces the river and is provided with a maximum number of windows for natural light and ventilation. Spacious quarters are provided for the personnel locker, toilet, shower, and lunchroom-kitchen facilities. Separate toilet facilities are provided for

● **SIDE VIEW of the municipal incinerator at Binghamton, N. Y., shows ash floor entrance. Weighmaster's office protrudes to allow view of scale, tipping area and the approaching trucks.**

the truck drivers at the tipping level. The office is so arranged that the superintendent can observe the approaching trucks, the scale platform, the tipping area, and the residue dumping area. With a window-mounted mirror he can also view the chimney effluent.

Bright colored paints were used throughout the plant and the result is pleasing and cheerful. Ceilings are white, interior columns are sun-yellow, exterior doors are deep turquoise. The incinerator chambers and flues are bright orange and black, electrical equipment is delft blue, and fire equipment is chinese red. Various other colors are used for other interiors and equipment. The beneficial effect is conducive to higher personnel morale, better plant cleanliness, and greater efficiency in operation and maintenance.

Operation

The incoming trucks are weighed from the weighmaster's office which is an integral part of the building and affords not only a clear view of the scale platform, but also of the tipping area. Refuse is dumped into a bin with a capacity of 200 tons or the equivalent of 16 hours of operation. A traveling bridge crane with bucket transfers the refuse from the storage bin to the two incinerator units. Fire protection for the storage bin, in addition to a standard fire hose standpipe system, consists of a dry pipe sprinkler system with automatic valve that can put a deluge of water over the bin. An enclosed tramp metal chute is installed from the charging floor to the residue truck runway. The charging floor man picks out five-gallon drums, baby carriages, and other tramp metals and drops them into the chute, which is emptied periodically by the residue truck driver.

The plant contains two circular mechanically stoked incinerators with a combined capacity of 300 tons per 24 hours. The crane bucket delivers the refuse to a hopper on the charging floor. The hopper is liberally sized so as to keep floor spillage to a minimum, but in addition a sloped splash plate has been provided between the hopper and building wall to speed up the charging operation. When the operator is ready for a charge, he opens an electrically operated charging gate by means of a push button. The charging gate is located over the unit and a walkway is provided for cleaning and lubricating the equipment.

Within the ignition chamber, refuse is continuously stoked to the outer periphery of grates. The stoking mechanism is conical shaped with three arms radiating from the base to provide the stoking action. A fractional horsepower motor drives the stoker through a reducer, shafting, and bevel gears. The complete drive is provided with shear pin protection and can be easily lubricated from a central point outside the furnace.

Each incinerator has a forced draft fan for undergrate combustion air, or the units can operate under natural draft by opening an ash pit door. The stoking mechanism is air-cooled by a separate fan. This air is delivered by the stoker into the center of the burning mass of refuse for combustion.

Residue is removed by lowering the outer periphery grates and dropping the ash into a conical shaped hopper with a brick lining. After the ash has been thoroughly quenched with water, the gate at the bottom of the hopper is opened, and the residue dropped into a truck.

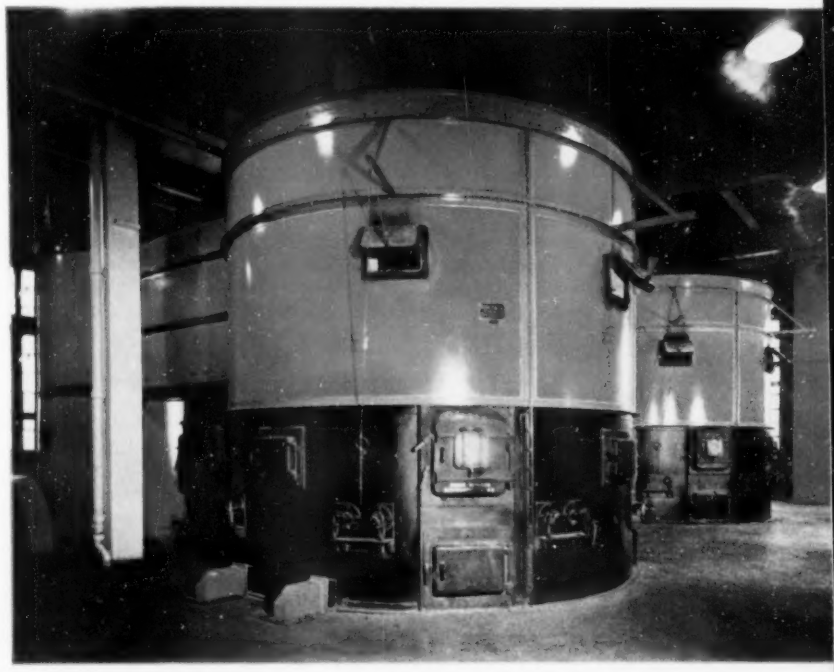
Gases leave the ignition chamber, by means of an overpass flue, and enter a two-story circular combustion chamber. With the detention period provided in the combustion chamber, all combustible gases are burned and a temperature of approximately 1800 degrees F is maintained. If the temperature tends to exceed 1800 deg F overfire doors in the ignition chamber are opened to bring in diluting air.

Fly-Ash Control

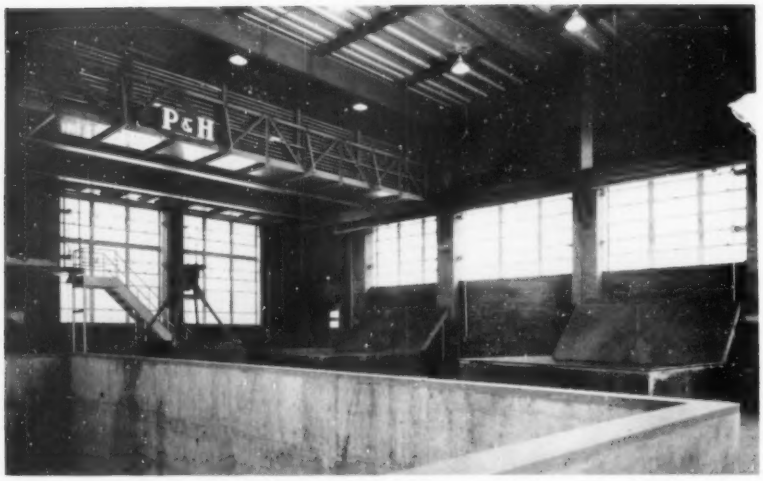
The combustion chamber traps a high proportion of fly ash carried by the products of combustion. This is removed weekly through a 3-foot by 4-foot access door at the base of the chamber adjacent to the residue truck runway. Access through this door also permits use of the combustion chamber as an animal crematory.

A prime objective of the consulting engineers who designed the plant was to provide a chimney effluent with minimum fly-ash content, without depending on mechanical entrapment. Their solution was a settling chamber 47.75 ft. long by 22.0 ft. wide by 12.0 ft. high. Four clean-out doors are spaced throughout the length of the chamber with checker walls in between to provide additional flyash traps.

Unit flues carry the products of combustion from the combustion chamber to the settling chamber. Each unit flue has a refractory damper operated by electric winch so that either unit can be shut down while the other is in operation. The flue that connects the settling chamber with the chimney



● **USE OF COLOR** is shown in this operating floor view of the two circular mechanically stoked incinerators with temperature control, access and observation doors.



• **FAST operation of the crane and bucket is assured by the provision of large sized hoppers with splash plates. These also reduce the amount of floor clean-up necessary.**

also has a damper that is manually operated. The chimney has an internal diameter of 10 feet and a height of 145 feet from grade.

Each unit has its own control station at the operating floor level. Each station has a pyrometer to indicate the operating temperature, push buttons to operate the charging gates, fans, and other appurtenances, as well as colored bullseye lights to indicate which equipment is in operation. An audio system consisting of telephone-type handsets and loudspeakers provides communication between the three floors for coordinating the operations. A two-point recording pyrometer with high temperature alarm light is in the superintendent's office for supervisory and record purposes.

Personnel

The crew that normally operates the equipment consists of one crane operator, one charging floor man, two operating floor men, and one ash floor man. In addition there is a weighmaster, supervisory and janitorial personnel, and enough relief men to operate the plant 12 hours per day.

Representing the City of Binghamton during the design and construction period was Mayor Donald W. Kramer; the mayor's executive assistant, John J. Burns, who is now the mayor; and City Engineer Regis C. McNamara. Design of the entire plant and supervision during construction were provided by the Consulting Engineers, Leonard S. Wegman Co. of New York City.* The Morse Boulger Destructor company of New York City furnished the circular mechanically stoked furnaces.

*A comprehensive discussion of the design and construction of the Binghamton Municipal Incinerator by Leonard S. Wegman appeared in the June, 1958, issue of Civil Engineering under the title "Binghamton's Incinerator after One Year".

Barrier Separates Traffic Lanes

MANY OLDER highways and a great many bridges have comparatively narrow traffic lanes. The increasing density of traffic, the higher speeds and the greater widths of newer automobiles make it necessary to utilize all of the travelable width of existing lanes. A new device to accomplish this, the Isle-Guard, is designed to separate opposing lanes of traffic and to prevent serious accidents due to head-on collisions.

This guard is composed of steel filled concrete, held to the pavement by bolts, and so designed as to prevent cross-over into the opposing lane, flip-over accidents and ground-looping; and in general to reduce the severity of those accidents that inevitably occur.

The barrier is continuous, without projections such as bolts or posts on which cars can snag. It is 26 ins. high, with sides sloping at an angle of 67.75°. This angle has been found most satisfactory for checking the moderate side-motion collision without deflecting the vehicle into another traffic lane. The barrier is sufficiently strong to withstand any expectable head-on collision by a heavy trailer truck.

Atop of the sloping sides is a concrete beam 2 ins. deep and 6½ ins. wide. This overhangs the upper part of the sloping side but cannot be rubbed by passing cars because the width at the base is 22½ ins., providing an 8-in. clearance. The guard is fastened to the pavement by bolts anchored into holes drilled into the pavement about 30 ins. apart. On especially hazardous places, the strength of the guard can be further increased by placing the bolts nearer together. The normal spacing is designed to withstand a 50-ton force against the top of the guard. Installation can be carried out at the rate of up to approximately a quarter of a mile per shift using a crew of about 12 men. Plastic or other reflectors can be attached and headlight glare shields installed where desired.

The barrier is designed for installation on bridges; elevated or depressed highways; on four-lane undivided highways; and on other narrow and heavily traveled sections.

• **VEHICLES hug smooth Isle-Gard barrier on heavily traveled bridge, thus increasing the roadway travel capacity.**

● **LANDFILL** near Rockdale, Ill., serving Joliet and other nearby communities is typical of a well-operated installation.
Courtesy International Harvester

OPERATION OF Sanitary Landfills

PROPER operation of a sanitary landfill begins with the selection of the site. The factors existing at the site will influence the ability of the community to dispose of its refuse economically and without nuisance or complaint; and will also affect the choice of equipment. In choosing a site, consideration should be given to the following factors: Economic haulage distance from the collection area; proximity of highly developed and congested areas, creating possible traffic interference; cost of land acquisition; soil type; cost of site development; seasonal wind directions; existing zoning regulations; and public acceptance.

Any area subject to future development should be laid out according to well-developed planning principles, and the fill plan determined in accordance therewith. For instance, areas intended for future streets and alleys, if filled with refuse, will be subject to some settlement and utility construction will be difficult. Therefore, such areas should be dirt-filled. If intended for land reclamation for industrial use, planning principles should be similarly applied.

Factors to Consider

Distance of Haul: It costs money to transport refuse so the disposal site should be as close in as is permissible. At a speed of 25 miles per hour, it will cost at least 35 cents a mile for hauling, probably more. This assumes that the collectors ride the truck to and from the disposal site. Since it is difficult to provide other work for them to do during the haul period, their pay must usually be included in the hauling costs. Thus a landfill site five miles out will cost at least $2 per trip more than one that is two miles away.

Hauling costs are not likely to be a deciding factor in most cases but they need to be considered.

Area Needed: In general, an area should be large enough to permit disposal for a period of at least five years. The population served, topography, type of soil, method of making the fill and the kind of refuse acceptable affect the area needed. An acre a year per 10,000 population is probably the minimum that can be considered desirable. However, landfill operations are rather readily movable and even small areas can be utilized, especially where land reclamation is a factor.

Neighbors: In selecting a site, consideration must be given to people residing in the vicinity. Though a properly operated landfill is odorless and does not produce insects or rodents, it has some undesirable features as a neighbor. The potential sources of trouble include congregation or frequent passage of collection vehicles; possible use by private dumpers and the public; some blowing around of loose papers; and the possibility of a dust nuisance. It is best to consider the possibility of such objections in advance of site selection; but first class operation after starting is the best insurance against complaints or suits thereafter.

Any area generating heavy traffic with consequent likelihood of delays for refuse vehicles should be avoided. Delays not only cost money (15 to 20 cents per minute) but may disrupt collection schedules.

Costs: The cost of the land and the cost of developing it for use may be influenced by, among other items, the following: Access road construction; fencing; drainage; turnarounds; topography; type of soil; and availability of cover material. In colder areas, plowing of the roads to the site, including the access road, during or after snowstorms may be a factor. The cost of hauling, based on distance, road conditions and terrain, should be considered in evaluating the cost of a site. In case of agreement with the landowner for a lease and token rental in return for filling the land, some of these costs will not be involved.

Topography: The topography of the site may determine the type of landfill used, and also the equipment for operation. For instance, a marsh area may dictate the use of a dragline for trenching; and trench-type fill may indicate use of a bull-clam or loader equipped tractor. The type of soil may affect costs and methods of operation. The possibility of stream pollution from seepage, or improbably, pollution of ground water in cases of high water table, may limit the location or the depth of the fill. Availability of good cover material without added hauling will be an important cost-of-operation factor. By good cover material is meant dirt that will compact readily with a reasonable number of equipment passes and that will carry the wheel loads of normal collection equipment even during periods of wet weather.

Control: It is difficult or impossible to obtain good operation unless control of dumping by private haulers and others can be maintained. While, it is generally desirable to permit such use of the fill, good operating practices must be observed. Use of the landfill by others should be restricted to normal working hours; refuse must be dumped only at the working face of the fill; and material difficult to handle or liable to damage equipment or injure personnel should be prohibited. Fencing of the fill area should be considered for a variety of reasons, using, as the situation warrants, a fence completely around the fill area or merely at the entrance. In addition to a permanent fence for control purposes, lightweight temporary fences may be needed to prevent blowing paper from creating a nuisance.

Cover: Cover material for the compacted refuse should be (a) readily available and (b) of a soil type that is capable of being compacted, that is, it should contain some clay. Practically all refuse is more or less heavily infested with fly eggs when collected. Research has shown that these eggs will hatch in the fill and that the flies can emerge through as much as 4 to 5 feet of uncompacted cover—sand or binderless soil; but 4 or 8 inches of closely compacted soil will prevent emergence. A thin layer of soil, not even compacted, will prevent flies from laying eggs on the refuse in the fill, but this cover must be complete. Therefore, a prompt compaction of the refuse and careful coverage with soil greatly reduces the fly problem, even though the cover soil does not compact well. In such cases, a soil with suitable binder properties should be used for the final cover. Black and Barnes give four essentials of cover material: (1) soil that can be compacted; (2) suitable equipment for compacting the soil; (3) adequate range of soil moisture; and (4) adequate thickness of cover.

Since much of the refuse reaching the fill is already infested with fly eggs, and since hatching takes place in 6 or 7 days under warm and moist weather conditions, a compacted cover should be provided to prevent emergence of the larvae. If collections are at 4-day intervals—as Thursday and Monday, a compacted cover 4 to 8 ins. thick should be provided at least every three days, with loose cover on the other days. Of course, when the desired fill height is reached, a heavy (2-ft.) cover should be placed and compacted.

It is sound practice and costs little more to compact the daily thin cover. This provides a margin of safety against fly emergence and allows for unfavorable weather conditions and equipment breakdown or need for use elsewhere.

Preparation of the Site

The area should be mapped and operations planned well in advance, the plans to include whatever future use of the area is desired. Based on this overall plan, the details can then be started. An access road is necessary. Except for small communities, this should be two-way; and in any event it should be hard-surfaced and designed to carry the heavy traffic resulting from loaded refuse collection vehicles. At the fill, a dumping area, with turnaround is necessary. If in a snow area, the layout should be designed to facilitate snow plowing and to permit winter operations. Other jobs will include demolition of existing unwanted structures; provision of drainage, electric light and telephone facilities; and construction of shelter for men and equipment, with toilet, shower and lavatory services.

If possible, water under pressure should be available. When the site is too remote from municipal water lines, a local supply should be developed, as a well, with pump and storage tank. In connecting to city water lines, precaution should be taken to prevent back-siphonage. Water is necessary in case of fire,

Courtesy Caterpillar Tractor Co.

● **LANDFILL operation near Killeen and Fort Hood, Tex., illustrates method of working in a relatively flat terrain.**

and desirable for wetting down refuse to reduce dust and improve compaction and for adding to dry cover dirt to improve compaction.

Fencing is desirable or necessary unless natural factors prevent or restrict access, since a fill cannot be controlled and cannot operate properly if it is subject to unrestricted dumping by private collectors and others.

A building should be provided to shelter equipment, tools and supplies. The size will depend on the amount of equipment used at the fill. A steel building is neat in appearance, portable and can be taken down and erected at another site when the fill is completed.

Drainage may be necessary to lower the ground water level, protect the fill from wash or protect the access road. Likewise flood protection may be needed to prevent washing away of a portion of the completed fill during high water periods. This will apply especially in ravine or gully filling operations where the toe of the fill is subject to overflow by a stream during high water periods.

Methods Used

The operating method to be employed in the construction of a sanitary land-fill is determined largely by the topography of the landfill site. In any case the objectives are the same: To compact the refuse thoroughly; to cover each day's accumulation with a layer of earth 6 or 8 inches in thickness so that no refuse remains uncovered over night; and to provide a final grade by placing a solidly compacted earth cover two feet thick over completed fill sections.

A variety of terms have been used to describe landfill methods, but the different operating techniques are most commonly referred to as Trench, Ramp and Area methods.

Trench Method—Where the terrain is flat, the trench or "cut and cover" method normally is used. There are three ways in which this can be accomplished. Landfill may proceed along a single progressive trench, which advances as cover material is excavated from the end of the trench to cover the garbage and refuse disposed of each day. The opened excavation serves for the disposal of the following day's waste. To minimize tractor travel, the length of the open section may be kept short.

In another variation of the single trench method, a long open trench is dug and the excavated material piled at the sides to provide cover. This type of trench is especially suitable where large quantities of refuse are handled or where heavy or frozen soil conditions exist.

A third variation of the trench method employs two trenches. After the first trench is excavated for the full length of the projected fill it is used for the disposal of refuse. Cover material is secured from a second trench cut parallel to the first one and separated from it by at least two feet of undisturbed earth. By the time the first trench is filled, the second is excavated; and a succession of trenches may be constructed in the same manner until the site is completed.

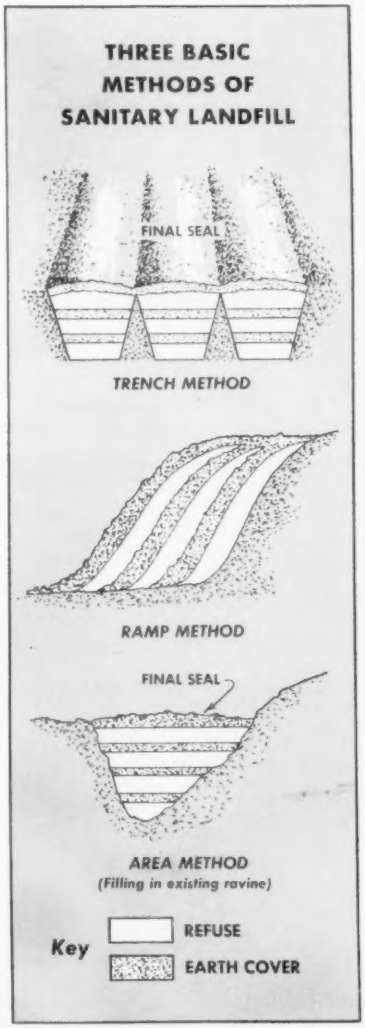
As in the single trench method, this operation is well suited for the disposal of large quantities of refuse, and the material excavated from the first trench frequently is of value for grading approach roads and as a reserve cover stockpile.

Trenches should be dug deep enough to provide ample material for the daily seals and the final cover. On the average, they are made 6 to 8 feet deep; though greater depths may appear desirable where land is scarce, it is usually best to limit the depth to about 8 ft. It is recommended that the width be at least twice that of the tractor tread to allow good compaction. In larger communities, widths up to 25 to 30 feet are used to permit simultaneous dumping of more than one truck. Trenches are limited in length only by site conditions and may be from 200 feet up to the length of the site.

Ramp Method—This term has been used to refer to landfills in rolling or swampy terrain where the slope of a bank forms a natural ramp or where an artificial ramp has been constructed to form a working face. Refuse is dumped at the bottom of the bank or ramp and is spread and compacted against the face in layers. Each day's accumulation is worked into a compact cell and is covered on the top and sides with material excavated from the toe of the fill. As the fill is brought up to the desired final grade it is covered with two-foot thick compacted final cover. With this method of operation it is important that the angle of the working face should not exceed 30°.

Area Method—Gullies or ravines, abandoned quarries, gravel pits or strip mines and river bottom land have been successfully reclaimed by the area method of sanitary landfill. The refuse is dumped into these low places, compacted into a tight layer, and covered with material obtained from the side slopes or from the bottom of the working face. Successive layers are built up, each refuse layer being covered with 6 or 8 inches of earth, until the depression is filled. The final grade should be established to produce a level surface after the surrounding high sections have been cut off and utilized for cover. Where depressions are extremely steep it may be necessary to prepare the site initially by cutting an approach ramp at a workable angle. In all operations, whether using the trench method or sidehill or ravine procedures, cover should be provided at the end of each day so that no refuse remains uncovered over night. This cover need not be

(*Continued on page* 206)



Courtesy Allis-Chalmers

● **DIAGRAM shows construction of the so-called Trench, Ramp and Area methods used for sanitary landfills.**

SMALL SEWAGE TREATMENT PLANTS:
TRICKLING FILTERS

JOHN J. BAFFA
Consulting Engineer,
New York City

TRICKLING FILTERS are used for small sewage treatment works to provide biological treatment of sewage where primary treatment alone is not adequate. Filters may be standard rate or high rate. High rate filters may be single stage, single stage intermediate or two stage filters. Standard rate filters will provide a well nitrified and stable effluent. Results of high rate filter performance show BOD removal efficiency equal to that of standard rate filters but do not show comparable nitrification. The choice must be made on the basis of effluent requirements and considerations of economy.

A problem often encountered in connection with small treatment plants is the necessity to discharge the treatment plant effluent into a dry ditch or other normally dry natural drainage channel. Under these conditions, the pollution control agency will require a stable well nitrified effluent and some factor of safety toward sustained performance. A common solution to this problem is to place a sand filter after a trickling filter. The purpose of the sand filter in this case, is to act as final polishing and straining agent and as a factor of safety during periods of standard rate filter unloading or low temperature periods or at times of emergency. Under these conditions, it is permissible to dose the sand filter at about eight times the rate that would be required for settled sewage. Thus, a two-story tank followed by a trickling filter which is then followed by a sand filter and chlorination is an often used small treatment plant arrangement. The final sand filter can be constructed as a subsurface filter with greater confidence against clogging when preceded by a trickling filter as compared with a septic tank. Confidence is increased in this case by the use of high rate filters since these filters do not unload and are generally free of filter fly larvae. However, in the small plant range, the cost of recirculation facilities for high rate filters can exceed the size savings resulting from the use of high rate filters in comparison with standard rate filters. Where final effluents are disposed of to the soil, filter effluents are much less prone to soil clogging than are septic tank effluents. Secondary (humus) sludges must be removed continuously because they become septic quickly. Recirculating humus sludge to the primary tank for mixing with primary sludge is effective. Small plants, in many cases, must be built close to habitations. Under these conditions, trickling filters can be covered to eliminate possible odors, though high rate filters are less subject to odor nuisance since they are kept fresh by recirculation and the high rates of application cause constant unloading; filter flies are essentially absent.

Plants serving industries and commercial establishments are subject to night-time, week-end or holiday shut-downs. Under these conditions, it is important to provide a means of automatic recirculation for standard rate filters so that the filter stone will be kept wet and biological action maintained. Covering of filters will eliminate freezing and snow and ice accumulations under these shut-down conditions. Covers will also maintain more favorable temperatures for biological action during cold weather operation.

Camps and summer resorts which require seasonal use of sewage treatment facilities are best served by a minimum of mechanical equipment due to the need for long winter shut-down periods. Under these conditions, unmechanized two-story tanks followed by standard rate trickling filters provide an adequate solution.

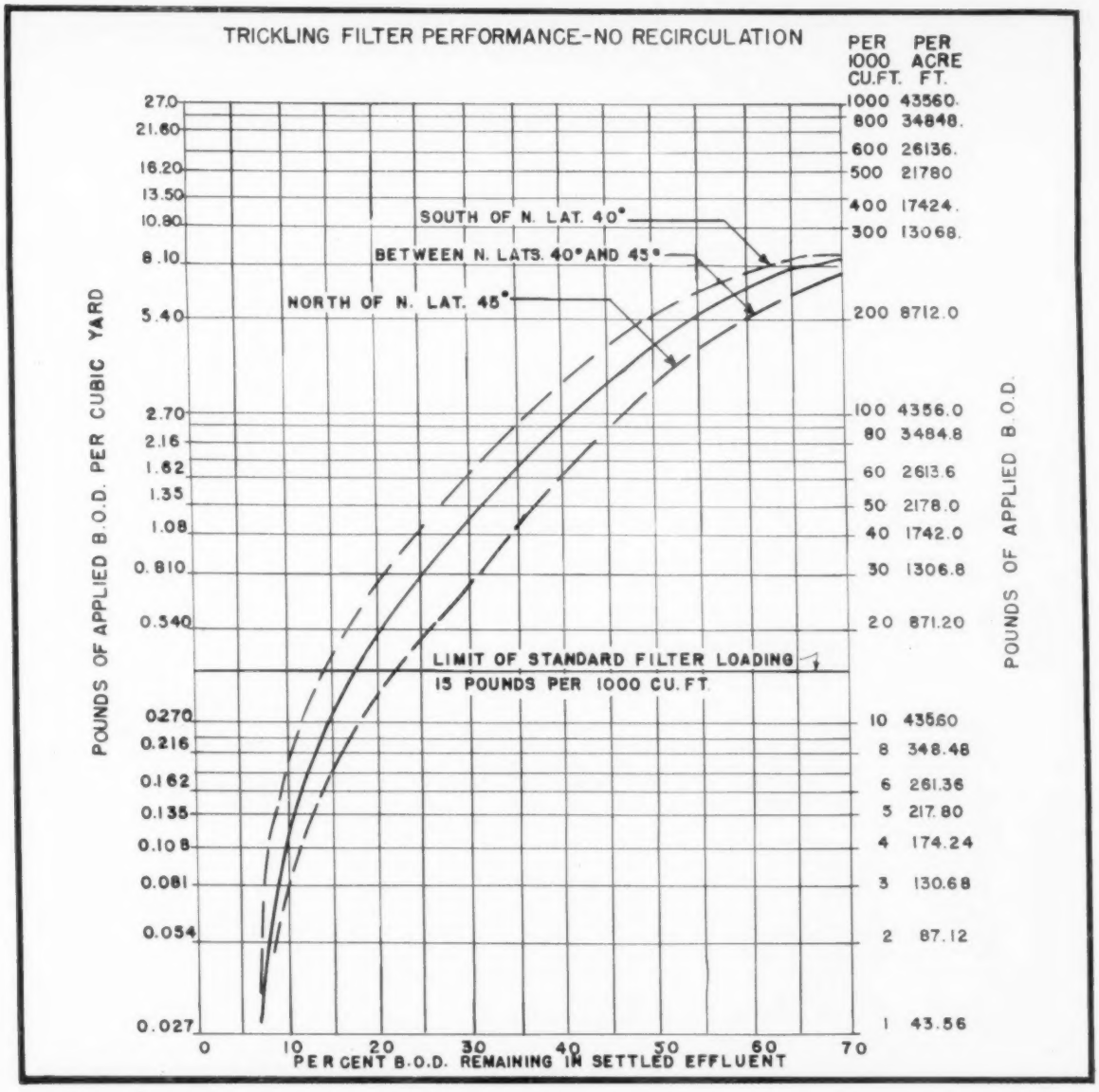
Courtesy Yeomans Brothers Company

• SHOPPING CENTER in Jacksonville, Fla., has its own compact treatment plant. Units include Spirahoff combination clarifier and digester and a trickling filter.

DESIGN CRITERIA

Standard Rate Filters

The standards for sewage works promulgated by the upper Mississippi River Board of Public Health Engineers and the Great Lakes Board of Public Health Engineers were adapted by the States of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania and Wisconsin and will hereinafter be referred to as the "Ten State Rules."

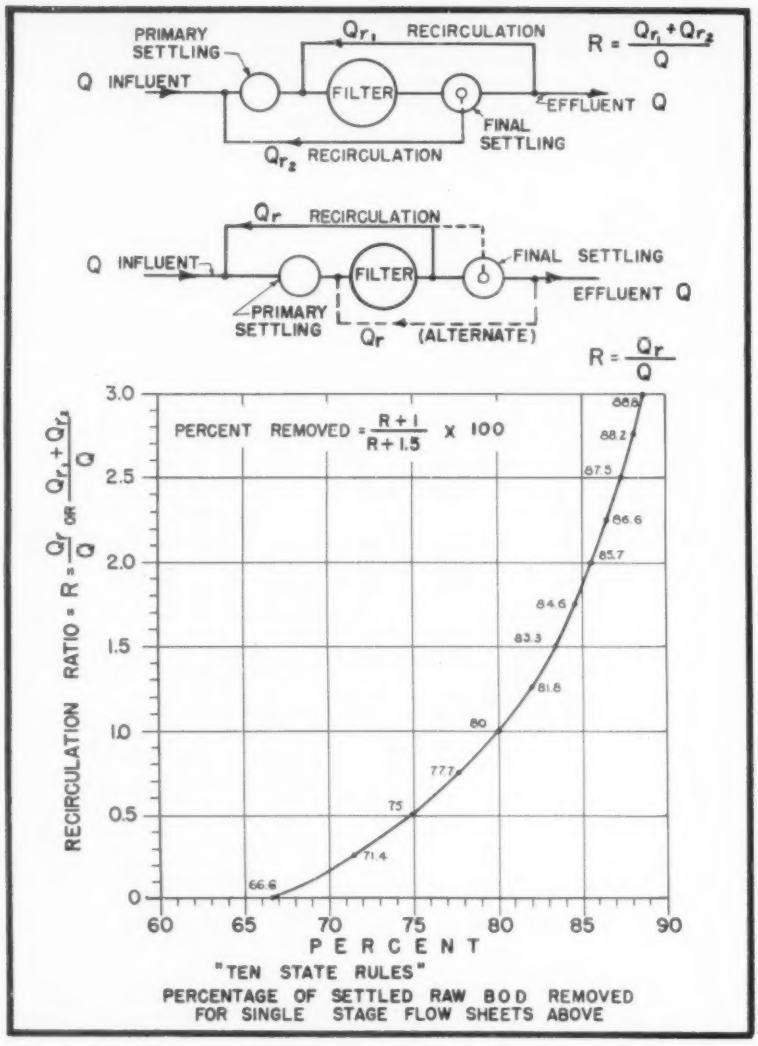


• **FIG. 1. Curve for determining the required size of trickling filters in terms of organic loading with no recirculation.**

These rules say that standard rate filters shall be dosed at less than four mgad with an applied BOD loading of less than 15 pounds per 1000 cubic feet per day. In comparing effluents from high rate filters with effluents from standard filters, the standards say that the observed 5-day BOD of the effluents should be reduced by the oxygen equivalent of the nitrate and nitrite contained in the effluents before results are compared. The Standards also state that "The filters shall be designed so as to provide the reduction in bio-chemical oxygen demand required to maintain satisfactory conditions in the water course into which the effluent will be discharged, or to condition properly the sewage for subsequent treatment processes."

The size of filters must be determined from the curves shown in Figure 1. Curve A should be used for installations located between north latitudes of 40° and 45°, Curve B for installations south of north latitude 40° and Curve C for installations north of north latitude 45°. For installations where critical stream conditions may occur in the winter period, the filter load shall be reduced sufficiently to assure the required effluent. Covered filters may be required at such locations.

The same requirements have been adopted by Florida, Colorado, Idaho, Wyoming, South Dakota and Utah. Connecticut allows a maximum loading of 400 pounds of BOD per acre foot per day (9.2 lbs. per 1000 cubic feet) or 3500 persons per acre foot per day with dosing rate of not over 300,000 gallons per acre foot. Kansas allows a maximum loading of 400 pounds per acre feet per day. New Jersey requires that the volume of sewage to be treated by standard rate filters shall not exceed 530,000 gallons per acre per day per foot of depth nor shall the average rate of application during the dosing period exceed 1100 gallons per minute per acre foot when the average 5-day BOD of the raw sewage is less than 215 ppm; if the average



• FIG. 2. BOD removal, settled raw sewage, for single stage trickling filters.

BOD of the raw sewage is more than 215 ppm maximum, the dosing rate shall not exceed 215 x 1100 divided by the 5-day BOD.

North Carolina allows a maximum BOD loading of 500 pounds per acre foot per day (11.4 lbs. per 1000 cubic feet) with a maximum dosing rate of 300,000 gallons per acre foot per day. Texas allows a loading of 450 pounds of BOD per acre foot per day (10.2 lbs. per 1000 cubic feet) and a dosing rate of 2,000,000 gallons per acre per day for 6.25 feet stone depth.

High Rate Filters

The "Ten State Rules" give the following design criteria for high rate filters: Dosing rate to be 10 to 30 million gallons per acre per day. The use of high rate filters, Types A and B, will be considered where a settled effluent with a 5-day BOD of 30 parts per million or more is acceptable, and where the applied load, recirculation included, does not exceed 110 pounds of 5-day BOD per 1000 cubic feet of filter media per 24 hours:

Type A: Sewage filters used with conventional primary settling tanks. The recirculation system shall supply sufficient dilution to the settled sewage so that the BOD of the influent to the filter, recirculation included, shall not exceed 3 times the BOD of the required settled effluent.

Type B: Sewage filters used after fine screens. The BOD of the filter influent, recirculation included, shall not exceed $3\frac{1}{3}$ times the BOD of the required settled effluent.

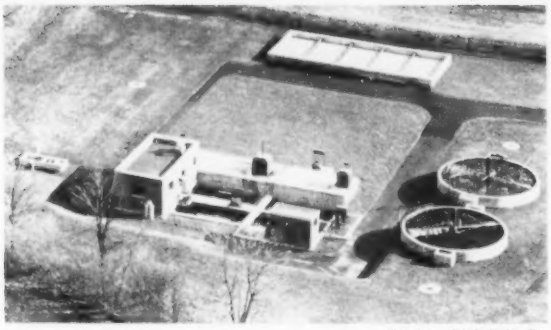
Type C: Sewage filters (roughing filters) designed for pre-treatment of unusually strong sewage. Filter loadings in excess of 110 pounds of 5-day BOD per 1000 cubic feet of filter media may be used. The reduction in BOD by filtration and subsequent settling may be assumed to be up to 64 percent, provided no reduction in excess of 110 pounds of 5-day BOD per 1000 cubic feet of media per 24 hours is assumed. The maximum allowable BOD removal for filters of this type, not followed immediately by sedimentation, shall be 50 percent.

Type D: Two-stage filters. The use of second stage filters will be considered as a means of reducing the 5-day BOD of settled effluent below 30 parts per million on the following basis: a. The BOD load applied to the second stage filter, recirculation included, shall not exceed two times the BOD expected in the settled effluent. b. When the effluent of the first stage filter is applied directly to the second stage filter without intermediate settling, the assumed BOD removal by the first stage filter shall not exceed 50 percent.

Filter sizes for Types A and B single-stage filters and for two-stage filters according to these regulations, are shown graphically in terms of efficiency in Figures 2 to 4 inclusive.

The following rules are given as applying specifically to high rate filters: **a. Recirculation:** A controlled recirculation system should be provided to maintain continuous dosing at a rate always equal to or in excess of ten million gallons per acre per 24 hours. **b. Distribution:** The distribution system should provide continuous discharge onto the filter. The rest period during which any unit area receives no sewage, should not be in excess of 15 seconds. **c. Flow Measurement:** Devices should be provided to permit measurement of flow to filter, or of recirculated effluent, whenever recirculation is used.

Requirements similar to the Ten State Rules have been adopted by Florida, except that no provision is made for sewage filters used after fine screens. The Ten State Rules have also been adopted by Colorado, Wyoming, South Dakota, and Utah. Connecticut requires that for high rate filters, the BOD loading should not exceed 3000 pounds per acre feet per day (69 lbs. per 1000 cubic feet); the dosing rate should fall between 10 to 30 mgd. North Carolina allows a minimum BOD loading of 1300 pounds per acre foot and a maximum 3000 pounds per acre foot with dosing rate 10 to 25 mgd. New Jersey requires dosage to exceed 1.8 pounds of 5-day BOD per cubic yard (66 lbs. per 1000 cubic feet).



Courtesy Link-Belt Co.

• **HIGH rate filter is used to treat the sewage and industrial wastes from the Link-Belt Co. plant at Colmar, Penna.**

Courtesy Dorr-Oliver

• **LOW RATE trickling filter is followed by sand filters at this college plant in Maryland. Design flow is 50,000 gpd.**

Idaho requirements are: a. In general, a single-stage high rate filter for treatment of normal domestic sewage may be loaded at the rate of 1.5 to 2.0 lbs. of BOD per cubic yard. At this loading, the combination of the filter and subsequent clarifier may be expected to effect a reduction of 65 percent in the BOD. b. Use of other loadings or of two-stage filters should be considered in the event industrial wastes are present or where a higher degree of treatment is required. The basis of design for these other conditions should be discussed with the pollution control agency and their confirmation on expected removals obtained prior to preparation of plans or reports.

Texas requires that 5-day BOD loading be not more than 2000 lbs. per acre foot per day with dosing rate in excess of 20 mgd., providing BOD loading requirements are satisfied. Texas requires the use of a sand filter after single stage high rate filters.

Design Details

The detailed requirements of the Ten State Rules are as follows:

Dosing Equipment: a. Distribution: The sewage may be distributed over the filter by rotary distributors, or other suitable devices.

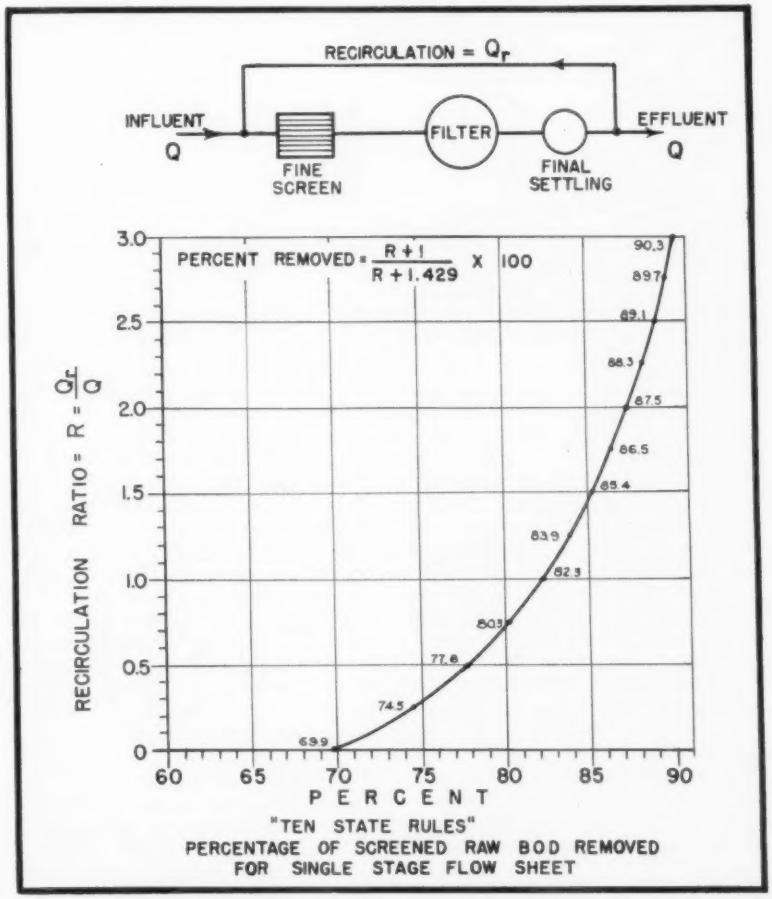
b. Dosing: The distribution devices may be actuated by siphons or pumps, or by gravity discharge from preceding treatment plant units when suitable flow characteristics have been developed.

c. Hydraulics: All hydraulic factors involving proper distribution of sewage on the filters should be carefully calculated. For reaction type distributors, a minimum head of 12 inches between low water level in siphon chamber and center of arms is desirable.

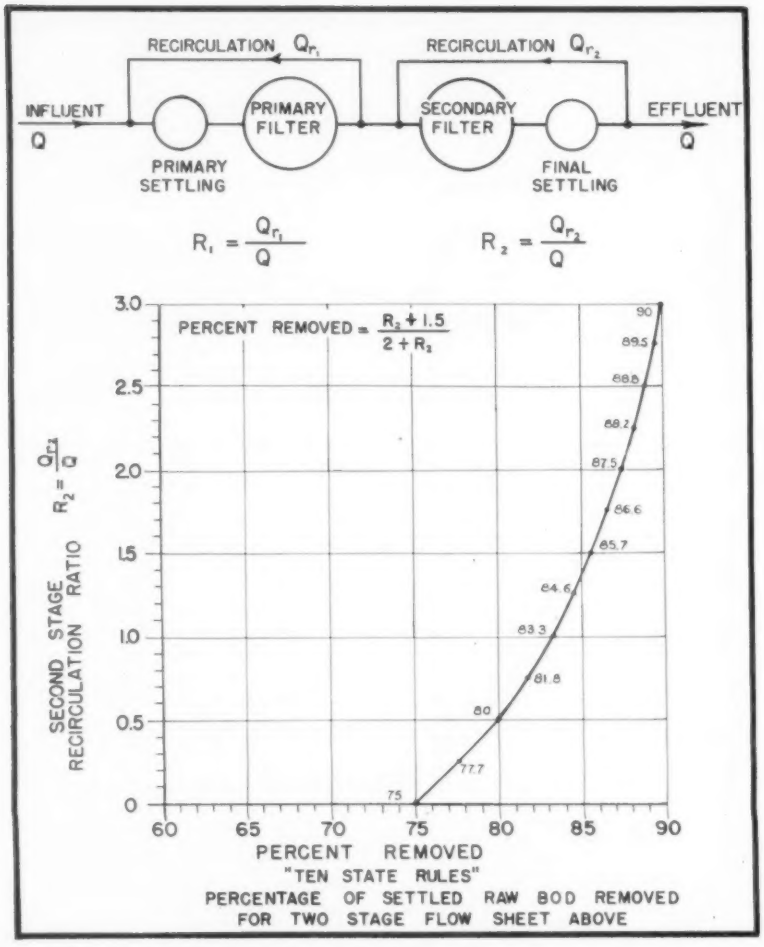
d. Uniformity of Distribution: The sewage should be distributed as uniformly as possible, and so that at least 90 percent of the surface area receives sewage directly. At dry weather design flow, or at a rate as near the dry weather design flow as is possible to obtain at the time of testing, the deviation from a calculated uniformly distributed volume per unit area of the area receiving sewage directly shall not exceed plus or minus 5 percent on the outer 90 percent of the filter area and plus or minus 10 percent on the inner 10 percent of the filter area.

e. Clearance: A minimum clearance between media and distributor arms of six inches shall be provided. Greater clearance is essential where icing occurs.

Media: a. Quality: The media may be crushed rock, slag, or specially manufactured material and shall be resistant to spalling or flaking and be relatively insoluble in sewage.



• **FIG. 3. BOD removal with single stage filters preceded by fine screen unit.**



• **FIG. 4. Curve shows BOD removal, settled sewage, by two-stage trickling filter.**

The top 18 inches shall have a loss by the 20-cycle, sodium sulfate test of not more than 10 percent, as prescribed by ASCE Manual of Engineering Practice No. 13, the balance to pass a 10-cycle test using the same criteria. Slag media shall be free from iron.

b. Size: Rock or slag media shall be of a size that will pass a 3½-inch square screen and be retained on a 2-inch square screen. It shall be free from dust, clay, sand or fine material. The media should be approximately cubical in shape and free from flat or elongated pieces.

c. Placing Media: The media shall be screened or forked at the sewage treatment plant site to remove all fines. The media shall be placed in the filter by hand operated equipment or by belt conveyor, and so as to minimize abrasion. Selected media shall be manually placed over the underdrains to a depth of about 8 inches.

Underdrainage System: a. Arrangement: Underdrains with semi-circular inverts or equivalent should be provided and the underdrainage system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 percent of the surface area of the filter.

b. Slope: The underdrains shall have a minimum slope of 1 percent. Effluent channels shall be designed to produce a minimum velocity of 2 feet per second at average daily rate of application to the filter.

c. Flushing: Provision should be made for flushing the underdrains. In small filters, use of a peripheral head channel with vertical vents is acceptable for flushing purposes. Inspection facilities should be provided.

d. Ventilation: The underdrain system, effluent channels, and effluent pipe should be designed to permit free passage of air. The size of drains, channels, and pipe should be such that not more than 50 percent of their cross sectional area will be submerged under the design hydraulic loading. Consideration should be given in the design of the effluent channels to the possibility of eventual conversion to high rate filter operation.

Depth: The filter media should have a minimum depth of 5 feet above the underdrains and should not exceed 7 feet in depth.

Sewage Application: a. Dosing Interval: The rest period between the application of sewage to the filter at design rate should generally not exceed 5 minutes. b. Recirculation: Consideration should be given to piping arrangement which will permit recirculation, especially when strong sewage is to be treated and/or where the design includes high organic loads.

Special Features: a. Flooding: Consideration should be given to the design of filter structures so that they may be flooded. b. Maintenance: All distribution devices, underdrains, channels, and pipes should be installed so that they may be properly maintained, flushed or drained.

Equipment Available

The Dorr-Oliver "Completreator" provides two-stage trickling filters with two filters, two settling tanks, and digestion tank in a single complete "package" unit suitable for flows up to 13,000 gallons per day and the population equivalent on a solids basis of about 150 persons. Dorr-Oliver also furnishes rotary filter distributors down to 12 feet in diameter. "Duo-filter" and Clarifier units are also available for small plants.

Yeomans Bros. furnishes "packaged" trickling filter plants for small plants serving 50 to 2500 persons. These plants feature compact construction and include the two-story "Spiragester," and the "water wheel" rotary distributor for small filters and a rectangular hopper bottom final tank. This company also furnishes high capacity type distributors with centrifugal type nozzles for fine spray application.

The "Spiragester" and small rotary distributors are also furnished by Lakeside Engineering Corporation.

Small rotary distributors down to about 12 feet in diameter are also available from Smith & Loveless, R. B. Carter Company, Infilco, American Well Works, Walker Process Equipment Inc. and Pacific Flush Tank Company.

A complete line of dosing siphon equipment and distribution nozzle equipment is available from Pacific Flush Tank Company.

How a Watershed Program Can Be Developed for a Community

ONE OF THE successful methods for the economical control of water is the Federal government program for the protection of small watershed areas. In many cases, by carefully studying the topography of an area, we can establish a manageable section, that is, a "small watershed." It is this concept of the small watershed that may answer some of our problems of water management. The small watershed could well contribute materially to our supply of usable water.

This aspect is relatively new. It has been within only the last 50 years that we have been concerned enough with water management to initiate substantial legislative action. Since 1944 our understanding of the problem and its solution have developed into its present form as represented by Public Law 566 passed in 1954.

P. L. 566 has given us the basis for a water management program through creation of official machinery for developing small watersheds. P. L. 566 is a Federal law that differs in one vital aspect from most legislation. In order for a watershed to be considered, the idea and the original request must come from an organization of local citizens who will benefit from an impoundment. If the State government and the Federal government concur in the need for the project, Federal and State aid may be authorized. Federal funds may be authorized to cover up to 50 percent of the total cost of developing an approved watershed. Here is how a community or area can develop a watershed project:

First the desire must come from those people who will benefit directly from the watershed control. Standard application forms are available from the Soil Conservation Service (SCS) which will also advise the group where to send the application. The application includes information on the size and location of the proposed project; a description of the problem and the extent of damages already experienced; details about the work needed; and information about the organization and source of funds.

When this request is received, technicians from the State agency and the SCS will examine the watershed. If the examination shows that a watershed project is feasible, and the State agency approves the application, the agency notifies the State Conservationist of the SCS with recommendations for action. The State Conservationist sends the application to Washington for review by the SCS Administrator.

Second is the work plan—a detailed analysis of what has to be done, how much money it will cost, and when the project can be completed. The work accomplished in a small watershed program will fall into two broad general classifications: (1) upland conservation measures; and (2) structures.

Upland conservation measures apply to soil and conservation practices such as terracing, grass waterways, diversion ditches and farm ponds. In order for a watershed to be considered for Federal participation, agreements that conservation will be practiced must be reached with the land holders of at least 50 percent of the area above (topographically) all the structures.

The structures must be designed for and be capable of retarding and detaining water and must include stream channel improvement for flood prevention, though the structures may also serve as reservoirs for water needed later. The law limits the size, stating that only with special authorization will a structure providing more than 5,000 acre-feet of floodwater retention be permitted; if more than one structure is planned, the maximum total capacity is 25,000 acre-feet.

When the project has been approved by the SCS Administrator in Washington for planning assistance, the SCS goes over the plan with the sponsoring group and a preliminary survey of the watershed is made by the SCS. The possible costs and solutions are explored. If the SCS and the sponsoring group decide that the solution will be worth the money, the group will go on developing the plan.

Detailed field studies and consultations between the sponsoring group and the SCS develop the work plan further into a "tentative" one which describes the proposed measures, how they will be financed and when they will be installed. The tentative proposal is now forwarded to the SCS Administrator in Washington for his review and recommendations.

Photos courtesy Caterpillar Tractor Co.

• FEDERAL AID is available through the Soil Conservation Service for constructing reservoirs with capacity generally less than 5,000 acre-feet for floodwater control.

• **CONSTRUCTING a floodwater retarding dam in Texas. Since passage of PL 566 in 1954, 852 applications have been received.**

Upon receiving the Administrator's recommendations, the local sponsoring group and the SCS agree on a final work plan. This plan is returned to Washington where the Secretaries of the Army and Interior are offered the opportunity to review it. The Secretary of Agriculture then forwards the proposal for Congressional action through the President.

Congress has 45 days in which to consider the plan. If Congress approves or does not disapprove, funds will become available and the Administrator will authorize help in building structures and other improvements agreed upon in the work plan, and will notify the sponsoring group that help is available. Actual work can then begin.

The sponsoring group is responsible for installation work although the SCS may provide technical assistance in order to accomplish the work in the time specified in the work plan.

Land, easement and rights-of-way must be acquired by the sponsoring group before engineering plans and specifications are developed by the SCS. Money necessary to pay the group's share of the project must be raised by the sponsoring group before bids can be asked or contracts let.

The sponsoring group throughout the planning and later during actual construction is the driving force. The SCS serves as an aid to the local group's efforts. Also, after the work is completed the operation and maintenance of the watershed project is the responsibility of the sponsoring group.

Results in the short time P.L. 566 has been in effect have been most encouraging. As of May 1, 1958, 852 applications for small watershed projects had been received in Washington; of these, 351 have been approved for planning assistance and 83 have been approved for construction.

$21 Million Expressway Dedicated

• **ONE OF THE major grade separation structures on Michigan's recently completed 34.5-mile Fenton-Clio Expressway. This is located at North Rd. near Flint, Michigan.**

MICHIGAN'S 34.5 mile Fenton-Clio expressway is described as the longest continuous stretch of toll-free, limited access expressway in the Midwest and second longest in America, being exceeded only by the 38-mile San Bernardino freeway in California. The new expressway was dedicated July 3 by Governor G. Mennen Williams.

Located northwest of Detroit, the expressway forms a vital link in the 330-mile Ohio-to-Sault Ste. Marie expressway route, which Michigan's 5-year, $1.25 billion dollar construction program has scheduled to be completely under contract by 1960.

• • •

Interstate Highway Program Gaining Momentum in South Carolina

Construction of the Interstate Highway System in South Carolina has been rapidly gaining momentum during recent months, and indications are that progress will be even greater during the remaining months of 1958. Contracts had been awarded or approved for award on 82.5 project miles of Interstate routes by the end of March. Additional separate contracts had also been awarded for construction of more than 16,000 ft. of bridges.

Interstate System cost figures, including engineering, contingencies, contract costs and rights-of-way, totaled $19 million as of March 31. Chief Highway Commissioner Claude R. McMillan expects the department to spend $55 million to $60 million on the System alone during 1958. This data appeared in *Carolina Highways*.

STABILIZATION of SAND *with Asphaltic Materials*

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Director of Public Works
and City Engineer,
Greenville, Texas

IT IS almost impossible to discuss anything pertaining to streets or highways without giving some attention to the subject of the subgrade. Subgrade is the soil just beneath the base of the street and quite often is the topsoil of the surrounding area. This soil in its natural state will, in all probability, be unsuitable for direct application of the base course, but with a small amount of effort and expense it can be greatly improved and made to lengthen the life of the base by several years. This article gives the smaller city or county a method that results in a fairly easy to construct, economical and serviceable street or highway pavement from materials which may be near at hand.

Generally the clayey sands which have a low plasticity index, that is from 4 to 15, are the best suited for good subgrades, although these soils can have subgrade failures if not properly drained and compacted. The clays which show a high plasticity index, that is, from 15 through 40, are the most unsuitable soil for subgrades. However, if proper care is taken in the preparation of subgrades on these soils, they can support the base directly and show a good life span for light traffic roads without a great cost of construction.

• MOTOR grader is bringing in one side of the divided windrow to cover asphaltic material to start the mixing.

The first step in the preparation of any subgrade is to lay out the section of street or highway and work out the drainage problems so that there will be no standing water after rains.

The soil should next be cut out for a depth of at least 6 in. with a motor grader. The soil is windrowed on each side of the proposed street or highway and compacted as it is put back in place, using a pneumatic roller or a sheepsfoot roller.

If the soil is too wet it may have to be moved back and forth across the roadway several times with the motor grader to dry it to the proper moisture for compaction. If the soil is too dry, water may need to be added as the material is replaced and rolled.

A good subgrade is very important and no base or surface will remain in place very long if care is not taken in this first step of constructing a street or highway.

Emulsified Asphaltic Sand Base

The city of Greenville, although located on a black gumbo clay soil which has very high contraction from liquid state to dry state, has within six miles of the city a soil change, and the soil becomes a very fine clean sand without any contraction.

The laboratory analysis of this particular sand is as follows: Maximum dry density at optimum moisture—108.0 lbs. per cubic ft.; optimum moisture—7.9 percent; liquid limit—16.8; plasticity index 0; linear shrinkage 0 percent; and gradation-passing #10 sieve 100 percent, passing #10 sieve retained on #40 sieve 1 percent, passing #40 sieve retained on #80 sieve 19 percent, passing #80 sieve retained on #200 sieve 68 percent, and passing #200 sieve 12 percent. As can be seen from the analysis, the sand used is very fine and without clay or shrinkage.

If the facilities are not owned by the city or county to make the necessary tests there are always sev-

• WET SPOT in subgrade is removed to permit soil to dry out sufficiently for optimum compaction during construction.

• ASPHALTIC material is applied directly to the sand by the transport truck. Motor grader starts mixing immediately.

eral commercial testing laboratories available that will analyze the material for a reasonable charge. Approximately 40 lbs. of sample should be sent them with the tests that are required clearly stated.

In using asphaltic emulsion, one of the types that has been tried with this sand is S S-1-H which is very close to the Federal Government specification of SS-1, except the SS-1-H is a somewhat harder type. The tests on the residue from distillation are as follows: Penetration of 70 to 100 at 77°F with a 100-gram weight for 5 seconds; and a residue by distillation of about 63 percent. The temperature of application is from 60°F to 140°F.

The sand is placed in a windrow and thoroughly mixed by blading. In the mixing operations, the sand is measured by dump truck loads and placed on an abandoned street near the sand source. In this way, the quantity of sand is known and, since the old street surface does not take up any of the asphaltic material during mixing operation, the mixture can be closely controlled. The mixing operation could be carried out on the street or highway subgrade to be surfaced; however, thought must be given to traffic and loss of asphaltic material due to contact with the subgrade.

The sand must be at or slightly above optimum moisture before the emulsion is added. This is done by either drying or adding water as the sand is spread out and then placed back into a windrow in order to be sure of a uniform moisture content. Therefore several simple tests are required to make sure that the correct moisture content is reached. After this has been reached the sand is then ready for the emulsion.

The sand is divided and about 10 gals. of emulsion per cubic yard of sand is applied from a transport truck. The motor grader follows directly behind bringing in one of the windrows and starting the mixing operation. After this amount of emulsion has been thoroughly mixed into the sand, the operation is repeated until the total amount of emulsion in the sand is approximately 30 gals. per cubic yard.

This operation of application and mixing takes about 4 hours before the finished mixture is ready for placement.

The material prepared in this manner makes a good base when placed between curbs in a thickness from 4 inches up. It is slow curing with the type sand mentioned due to the moisture content and the absence of clay.

This type of emulsion would function much better in a soil that required a lower moisture content and had a plasticity index from 4 to 12. The emulsion has the advantage of being able to mix well in wet or damp material thereby giving great possibilities for mixing during the wetter periods of the year. It also is nonflammable and generally will require no heating before placement.

This material causes some difficulty in compaction and finishing by the low plasticity index and the moisture content. During the several days curing time the base requires a brief period of rolling each day with a pneumatic roller or a flat wheel roller. Final finishing at the end of the curing period is done with a grader and flat wheel roller.

This type of material was used by the city this spring and placed in a test section of street; therefore its endurance and wear will not be known until a longer period of time has elapsed.

Cut Back Asphaltic Sand Base

The same type of sand mentioned before has been used by the city for several years with RC-2 cutback asphalt as a stabilizing material. This type of cutback asphaltic material has the following tests on residue from distillation: Penetration of 120 to 150 at 77°F, with a 100-gram weight for 5 seconds; and a residue by distillation of approximately 82 percent at 680°F. The temperature of application is from 100°F to 170°F.

As seen from the specifications, the RC-2 has a greater amount of asphalt than does the SS-1-H emulsion, and because of this only 20 gals. of RC2 is used per cubic yard of sand.

The same mixing procedure is used as previously mentioned, except the sand must have a moisture content of less than 2 percent, or be completely dry. This characteristic limits the mixing of this type of material to the driest part of the summer months.

The material can be placed with or without curb and gutters and is fast setting; therefore the finishing can be done in one operation. The general appearance and texture is that of hot mix asphaltic concrete made from fine materials, and it can be used for any of the purposes for which hot mix asphaltic concrete might be used. It does not require any surface treatment.

An existing street with a 1½-in. leveling-up course over an existing flexible base and seal coat, had developed many large holes and became very rough. The existing surface was first given a very light tack coat of RC-2 asphalt; the asphaltic sand mix was then laid by a motor grader and rolled by a pneumatic roller and finished with a flat wheel roller. This street is subject to heavy traffic and after the materials have been in place long enough for the volatiles to cure out, it will receive a double asphaltic surface treatment.

The sand-asphaltic mix is also used for patching existing pavements, either flexible or concrete. It does not wrinkle or slide in hot weather once it has cured. Where it is necessary to make utility cuts, these must be made with pneumatic tools. Storage of the mixed material in stockpiles for as long as three months does not greatly injure its qualities, as it can be livened up by mixing in about 1 percent kerosene and worked as freely as ever.

The sand mentioned in this article may or may not be found in other locations, and either of the asphaltic materials mentioned may or may not give the desired results. The reader may take a few samples of the local soil (approximately one cubic foot each); secure from his nearest refinery a few samples of the types of asphaltic materials available; and try several combinations. One or more of the resulting mixtures may give a more economical type of repair or contruction than that which is now being used.

Definitions of Terms and Tests

Plasticity index and plastic limit as given in ASTM Bulletin D 424-54T. Liquid limit as given in ASTM Bulletin D 423-54T. Optimum moisture content as given in ASTM Bulletin D 698-57T.

• APPEARANCE of a sand-asphalt residential street after five years of service without surface treatment. Thickness is 4 inches on a subgrade of black gumbo soil.

CONSIDERATIONS
in the Purchase of
STREET SWEEPERS by CITIES

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City Engineer,
Exeter, California

WHILE THERE are about 1000 street sweepers purchased each year by cities in the United States, by far the majority of the cities purchase only one sweeper at a time. A street sweeper, in most cities, will not normally be replaced until after it has been in operation for at least 7 or 8 years.

There are now being manufactured four different types of sweepers: 1) Three-wheel design, front-wheel drive, rear single caster-wheel steer, all tires alike; 2) three-wheel design, front-wheel drive, rear single caster-wheel steer, rear tire of different size; 3) three-wheel design, rear-wheel drive, front double caster-wheel steer, two front tires of different size than rear driving tires; and 4) four-wheel design, mounted on a commercial truck, all tires alike. All street sweepers, of all makes and types, employ the same general sweeping principles—gutter broom, deflector bar, main broom, dirt elevator or conveyor, dirt box, and water tank.

Sizes of Sweepers

There are today manufactured three sizes of street sweepers—2, 3 and 4 cubic yards. These sizes actually reflect, and are based upon, the capacity of the dirt box of the sweeper. When a city advertises for bids on a street sweeper it is likely that the very first specification will have reference to the size of the dirt box.

The capacities of dirt boxes, as referred to by sweeper manufacturers, are 2, 3 and 4 cubic yards; but the manufacturers of some sweepers are now referring to the capacity of the dirt box as "cubic yards plus," or "cubic yards effective," or "cubic yards actual," etc. It would seem to be quite impossible to give any specific meaning to words like plus, effective, actual, etc., and to do so would be trying to count what is not number, and to measure what is not space.

It will be advisable, in all cases, simply to regard these dirt box capacities of 2, 3 and 4 cubic yards, as nominal capacities, close enough for all practical purposes. No manufacturer of street sweepers has ever provided any definite or reliable method by which an operator can tell when he has a dirt box full of material. The experienced operator is supposed to be able to tell about when he has a full load of dirt by the way the sweeper handles, and he then dumps the load. All of the dirt, left in piles on the street, has to be later picked up and trucked away. There is no great difference, in the disposal problem, whether there are 3 piles, or 4 piles, or 5 piles.

The chances are that, with a 3-yard sweeper, the operator will not ordinarily dump a load of more than 2½ yards, and with a 4-yard sweeper, the operator will not dump more than 3½ yards.

Dirt Elevator in Connection with Dirt Box

In all street sweepers, (with the exception of a 2-yard sweeper made by one manufacturer), the dirt swept from the street is elevated to the dirt box by a belt conveyor or an elevator. One manufacturer uses an elevator consisting of rubber chains, running over steel sprockets, with squeegees. Another uses an elevator consisting of steel chains, running over rubber sprockets, with squeegees. A third uses an elevator consisting of steel chains, running over steel sprockets, with squeegees. A fourth manufacturer uses a rubber belt conveyor running over head and tail pulleys, with guide rolls.

The elevator, or the conveyor, must be operated at such a speed that, when the dirt has reached the top of the dirt box, it will be thrown into the box in such a way that the box can be evenly and completely filled.

One manufacturer makes a 2-yard sweeper, in which there is no elevator or conveyor of any kind. The broom that does the sweeping also throws the dirt up from the street into the dirt box.

Mechanical Versus Hydraulic Operation

There will be claims, one way or the other, by different manufacturers, as to mechanical versus hydraulic operations. These may not be important enough to cause any city official to make reference to them in the city specifications. Perhaps the most important thing will be that of maintenance. The maintenance men employed by a city may be better able to maintain mechanical equipment than they can maintain hydraulic equipment. City officials should give thought to this matter of maintenance before writing specifications.

In some street sweepers the gutter broom is placed amidship, between front and rear tires. The location of the gutter broom seems to be a controversial matter. Reference to the location of the gutter broom can be left out of city specifications; but it is still something that merits some preliminary investigation by city officials.

Water Tanks and Tires

The capacity of the water tanks, on the various makes of street sweepers varies from 170 gallons, as a minimum, to 275 gallons as a maximum. In cities where there are hydrants all over town, there might possibly be an advantage in a water tank of the smaller size. A gallon of water weighs 8.33 pounds, and the weight of 105 gallons, (the difference between 170 and 275), is 875 pounds. This additional weight of 875 pounds must be carried by the frame of the sweeper, and it must also be carried on tires that, when the sweeper is loaded, are already overloaded according to the tire manufacturers' ratings. The smaller tank may require one or two more fillings during a shift of operation, but it still might be both cheaper and safer in the end in many cases.

The tires used on all makes of sweepers, when the dirt box is filled,

are probably overloaded according to tire manufacturers' ratings. However, sweepers are operated at slow speeds, and there is little likelihood of any trouble due to this overloading.

The replacement of tires, due to wear, is greater on some sweepers than it is on others. City officials should inquire about this tire wear and tire replacement.

Before any specifications are written by a city it might be well for city officials to ask the sweeper manufacturers for information about the following points: 1) Separate weight on front axle, and separate weight on rear axle, with full load of water and gasoline, but with nothing in the dirt box; 2) same, with full load of water and gasoline and with dirt box filled to capacity; 3) total weight of sweeper, with dirt box empty and with dirt box filled; and 4) wheelbase.

With this information they can determine, in their own way, if one sweeper is likely to have any advantage over any other, so far as the tires are concerned. Sometimes the pavements in residential areas are of light construction, and the wheel load information will enable them to determine if these residential street pavements can effectively support the sweeper weight without pavement damage.

When writing specifications for a street sweeper consideration should first be given to the operator—his comfort, and his safety. Also thought should be given to maneuverability. There will be many more miles of streets swept every month if the operator is comfortable and if he feels safe.

After preliminary study of the operating and maintenance details, the City officials can then decide whether it should take bids on a three-wheel sweeper only, or on a four-wheel sweeper only, or whether it will accept, on an equal basis, either a three-wheel or a four-wheel sweeper. Whatever the decision might be, it should be based on definite and reliable information about both types.

City officials should study and investigate the details of the various makes of sweepers that will be offered, prior to the time of asking for bids, rather than to endeavor to do so after the bids have been taken.

Editor's Note:

G. H. Tennant adds another to the designs listed in paragraph 2. This is a 3-wheel design unit with rear-wheel drive, front single-wheel steer, and all tires the same size. It has a 1¾-yd. capacity. This company also states there are two sweepers not having a feed conveyor or elevator, one a 1¾-yd. and the other a 2-yd. unit.

The following added information is given: Dust control by use of a vacuum system instead of water spray is offered on one sweeper introduced recently. In this machine the two gutter brooms and main broom are inclosed in a vacuum-equipped housing. Turbulent dust from around the brooms is sucked up by a vacuum fan and forced through a special filter (540 sq. ft. area). The exhaust air is said to be nearly 100 percent dust-free.

Advantages claimed for the vacuum-and-brush system are said to include elimination of water tank, reduction in tire loads, elimination of hydrant stops and freeze-up problems, and somewhat smaller, more compact sweeper design. Sweepers of this type, while limited in hopper capacity, may be extremely useful in downtown areas where high standards of cleanliness are essential, with air-borne dust kept at a minimum.

• ONE-WAY traffic is no problem for the double gutter broom sweeper. Cities should consider the problems they have before writing their sweeper specifications.

STEEL LIP ON BLADE SPEEDS PAVING

• TO REMOVE the temporary patch placed in a narrow trench, this contractor used an 18" wide steel lip attached to his Skid-Shovel bucket.

AN 18-INCH steel lip was bolted to the cutting edge of the bucket of an International Drott TD-6 4-in-1 for gouging out a section of temporary pavement of a Los Angeles street. This special lip, devised by L. W. Fleming, Contractor, of Glendale, Calif., penetrated 10 to 16 inches deep. Previously, a gas line had been laid down the center of the street, backfilled and covered with a temporary patch so that traffic could use the street. When it came time to rip out the temporary patch and lay the permanent blacktop, the contractor built the steel lip which not only excavated the temporary filling but made it easy for the material to be loaded by the tractor. This arrangement permitted the contractor to block off only an 8-foot wide section of the street so traffic could move without interruption on either side.

SAN FRANCISCO PUTS "PERSONALITY" INTO TRAFFIC SIGNALS

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HAVE YOU ever cussed a traffic signal? Do you have a pet traffic signal you avoid if possible, because the red light is always against you? Have you wondered why some signals work well at times and poorly at other times?

If you answer "yes" to one or more of these questions you have subconsciously admitted that traffic signals in a sense have individual personalities apart from that of the traffic engineer who may have installed them.

San Francisco has learned that there is much more to the efficient use of traffic signals than mere installation. Signals do have "personality" in that different types can do different things and vary all the way from the simplest fixed time cycle two-phase operation to the very complex electronic operation which measures delays and traffic volumes and reproportions the green time as traffic conditions change.

However, before getting down to the "personality" of the traffic signals in San Francisco and what is being done to bring out that personality, let us first set the stage as to the outward appearance of the signals, how the decision is made to install them, how the pressure groups are answered and how many signals constitute the stage set being reviewed.

San Francisco's "Bird Cage" traffic signal with its ringing gong at the change from STOP to GO will become a thing of the past before this year ends. This signal was unique to San Francisco and as much a part of the character of the City as the Barbary Coast and four street-car tracks down Market Street in the years past.

Invented in 1927 by Ralph W. Wiley, then Chief of the Department of Electricity, it incorporated all the basic functions of variable cycle, split and offset. Timing changes could be made at a central control manually or by time clock. At the height of its use, this system controlled 216 intersections.

The first three-light traffic system was introduced in 1945 and gradually as new systems were added or old ones expanded, the Bird Cages have disappeared. There are now 15 Wiley installations remaining to be replaced this year and then San Francisco's complete signal system will consist of 683 intersections with 3-light installations.

• **BIRD-CAGE traffic signals were once characteristic of San Francisco; now they have almost wholly disappeared.**

Every attempt is made in San Francisco to hold hard and fast to the application of the *Uniform Manual for Traffic Control Devices* published by the Public Roads Administration and adopted by the California State Division of Highways.

Placement of Poles

Placement of signal poles at the intersection, and size, height and sequence of lights are uniform and in accordance with the Manual. The selection of intersections to be signalized are held as nearly as practical to the warrants recommended by the Uniform Manual but the operation and control equipment varies considerably as dictated by different traffic conditions.

Traffic signal lights are always installed on the curb line with additional signals when necessary at special locations, generally center islands. There are at least two signal faces visible to each flow of traffic and these are located at a uniform height of 10 feet to the bottom of the signal. Many times at skewed intersections when a signal location at the normal sidewalk curb would increase the visibility distance to over 100 feet, special islands are installed on which to locate closer supplementary signals.

The signals are always located on the far right and left sides of the intersection although a near side signal may be added at the top of a steep hill where visibility is restricted. Generally, one main street

• **SETTING back crosswalks and the use of turn lanes has increased markedly the efficiency of the signal operations.**

signal and one cross street signal are installed on each pole. However, in the case of long radius curve returns which would place one signal face to one side of the normal line of sight, an additional pole will be used with one signal face on each pole.

Insofar as possible, installation of traffic signal systems is based upon well studied time-space diagrams and minor cross streets poorly spaced are closed to cross traffic by a continuous center island. Public acceptance dictates the number of minor cross streets that can be closed but recognition of the need for this type of regulation is growing. Where closure of a poorly spaced intersection by a continuous center island is not possible, the mere presence of an island as a pedestrian refuge has often relieved the pressure for signals.

Isolated locations are selected by means of a priority calculation which is a San Francisco formula based upon the warrants outlined in the Uniform Manual. This formula reflects vehicular and pedestrian volumes, speed of traffic, traffic accident history and nearness of other traffic signals.

Study of Traffic Accidents

San Francisco has tried to counter pressure groups demanding traffic signals at locations which do not meet the minimum warrants of the Uniform Manual by making a study of traffic accidents. This study shows that traffic signals do not eliminate accidents. In 1956, a total of 17,877 traffic accidents were reported to the San Francisco Police Department of which a little over one half occurred at intersections. Of the accidents occurring at intersections, 3,762 or 38 percent took place at intersections with signals. Of all signalized intersections, 80 percent had 2 or more accidents. Only 18 intersections were without any reported accidents in 1956 and over a three-year period only two were free of accidents.

This information has served to prove that signals do not necessarily eliminate accidents and together with more detailed studies supports the need to depend upon minimum warrants in selecting locations for signal installations. The general findings have been that traffic signals tend to increase the number of accidents at locations with very low experience and decrease the number of accidents at locations with higher experience.

While uniformity of traffic signal installation is considered of prime importance, San Francisco's unusual street pattern, street and cable cars, unbalanced traffic volumes and other abnormal conditions have forced many unusual design treatments.

Special Signal Heads

For some of these unusual treatments, special signal heads have been designed. First a transit signal lens both green and red has been designed for the control of cable cars, street cars, buses or even railroad engines. The transit lens is a modification of the regular 8-in. traffic signal lens and is made by installing a black aluminum cut-out shield which confines the green or red light to a 1-in. stroke crossbuck. These crossbuck signal lights have no legal status but are operated in conjunction with regular traffic signals as informational lights for transit operators. Company rules of operational procedure control the respect given to the crossbuck signals.

Experience has shown that the crossbuck signals are not disturbing to the motorist even when easy for him to see and on occasions they have been added to the regular signal head without confusion.

Crossbuck signals have been used at railroad crossings to inform the engineer when vehicular traffic has been given a red light. They have also been used to advise streetcar operators at intersections with an all-red interval when to perform special movements such as a right turn from the center of a six-lane two-way street.

A second type of signal light has been designed for that fast disappearing type of motive power, the horse. At several locations where it is necessary to provide a crossing for equestrians through a high volume vehicular intersection, a horseshoe shaped shield is installed in red and green signal lenses to control the horseback rider. In some cases, this interval is a fixed-time period and in others, a high post mounted button has to be pressed by the rider in order to change from the red horseshoe signal to a green horseshoe signal.

Another type of supplemental informative signal used is a neon sign working in conjunction with a modified two-phase signal. Phase A_1 permits all straight through traffic to move and a three-lane left turn from one direction to enter and store in the center of a very wide, skewed intersection. Phase A_2 stops the straight through traffic which would be in conflict with the heavy left turn. Because of the angles and distances involved, it was felt that the normal left turn signal or left arrow would be confusing if used. As a result, two identical neon signs were designed to be operated by the signal controller as follows: Phase A_1 "Mission Street Left Turn Stop"; Phase A_2 "Mission Street Left Turn Go"; and Phase B—no message—sign blank. The words are all red neon except the word "Go" which is green.

There are many different aids which can be provided to make traffic signals more efficient and effective other than the "built-in" features of timing. For example, San Francisco has eliminated crosswalks at nine intersections in order that heavy turning movements can be accommodated. When the crosswalk is removed to benefit a heavy left turn movement, right turn arrows also move the companion flow from the main street at the time pedestrians are not walking. At approximately seven other locations, "WALK" — "WAIT" pedestrian signals cut pedestrian time to a minimum and turn arrows for the balance of green time not only

• GREEN HORSESHOE: A high mounted pushbutton permits the horsemen (and horsegirls) to stop traffic and cross busy traffic arteries with assurance of safety.

• NEON sign, shown enlarged above, says "STOP" or "GO" or its turns off completely in conjunction with the phasing of other signals controlling the intersection. The messages on the sign are all red neon except the word "GO" which is in green.

encourage the turns to move rapidly but discourage pedestrians from violating the "WAIT" signal.

Most of these specialized timing features need to be supplemented by other aids. Pedestrian barriers are used to inform the public that a crosswalk has been abolished. Special pavement markings and traffic signs are needed to inform the motorists that certain lanes are reserved for turning movements and often a centerline must be relocated to provide additional lanes so that some lanes can move while other lanes wait for their special signal.

Special Guide Lines

As further aid to efficient signal operation, many San Francisco intersections have special guide lines nine inches wide, painted both within the intersection and approaching the intersection to inform the motorist of the proper operation. Guide lines completely through the intersection are particularly important when multiple turning lanes are necessary.

San Francisco has also used a leading or lagging green light as an aid to heavy left turn movements at eleven intersections. The selection of a lead or lag for the direction with the heavy left turn depends upon several factors, the principal one of which is the location of the intersection on the time-space diagram.

While the description of the aids for turning movements previously described apply for the most part to normal right angle or "T" intersections, San Francisco has about twelve intersections where fancy angled streets require special channelization to accommodate turning movements. Much of the channelization at normal intersections simply provides a storage lane out of the path moving traffic leaving the left turn to take place without the benefit of a special signal when a gap in opposing traffic is presented. Some channelization, of course, is needed because the turning movement has its own separate signal phase.

In some cases, the channelization has as its only function the shortening of pedestrian walking distances or the strategic location of a traffic signal, both purposes being aids to better signal operation.

One-Way Streets

There are many more aids for efficient signal operation including turn prohibitions but one which is very often overlooked is the use of one-way operation to reduce conflicts. San Francisco's Market Street, a diagonal street with a street grid set at 45 degrees on the north side and a normal grid on the south side has presented many multilegged intersection signal problems. One-way streets have greatly simplified these problems by allowing all cross traffic to move on one signal phase without conflict.

Various combinations of one and two-way streets have been instituted, all designed to bring out the personality of these signals and improve the flow of traffic. There are about twelve intersections in the City thus treated.

One-way streets also aid traffic signal systems by simplifying coordination problems and reducing conflicts. San Francisco has taken advantage of this technique in downtown as well as in outlying areas. The motoring public always likes traffic signals on one-way streets "because those signals are so much better timed." Actually, it is the one-way operation that brings out the best in the signals.

Now one last word about the different "personalities" in San Francisco's traffic signals. There are 501 fixed-time traffic signals most of which are of the three-dial expansible type. Of these, 453 are interconnected into 20 signal systems.

The balance of 162 signalized intersections are operated by traffic actuated controllers and include semi and full-actuated types both of the density and non-density variety. Of these, a grid of 50 intersections are interconnected in a cycle-offset selection system controlled by the sampling of traffic in all four directions. Pedestrian "WALK" — "WAIT" signals are installed at 142 intersections and more are being added.

There are a great many personalities in this variety of signal types and San Francisco has concluded that to bring out the best in each, there are three basic rules which must be followed. Conformance to uniform national appearance is necessary. Location selection by the warrants of the Uniform Manual is the best assurance that signals won't increase accident experience. Finally, all the tricks in the trade must be called upon to aid and develop the fine personalities traffic signals have to offer in moving traffic smoothly, safely and efficiently.

• ELIMINATING a crosswalk by the use of pedestrian barriers and adding guide lines for automobiles permit signals to move more traffic safely and also faster.

CENTRALIZED MACHINE ACCOUNTING FURNISHES IMPORTANT OPERATING CONTROLS

Based upon an interview with
REBA E. PRICE,
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Richmond, Virginia

THE VIRGINIA Department of Highways is getting more mileage out of its budgets—saving taxpayers money, in other words—by utilizing one complete data processing installation to do all the accounting and record keeping work for 15 separate divisions. With the centralized system we are able to save time, personnel, equipment and money on the basic accounting jobs that have to be done by the various divisions of the Department and, at the same time, provide both the State and Federal government with the data they need—much of it almost impossible to accumulate manually because of the time and expense involved.

In addition, the centralized system is a major asset for the State as we launch into the Federal-aid Highway program in which Virginia's share is estimated to aggregate about $1,500,000,000. Fortunately our centralized IBM punched card installation has both the speed and flexibility to absorb the extra accounting and statistical work required.

The only addition planned to our data processing center—not as a direct outgrowth of the Federal-aid program but as a means for doing a more efficient job for the department as a whole—is an IBM 650 electronic computer which will be used initially for computing earthwork quantities, thereby eliminating time-consuming cross-section work and reducing the need for office engineers. Otherwise our present installation is sufficient to handle processing for all divisions of the Department.

As an example of the uses of this mechanized system, we are producing road and structure inventory logs for use by a number of divisions and for the field offices. We keep on file punched IBM cards for each section of road in Virginia—both the Federal and State systems. These cards are made on the IBM Cardpunches from field data which cover such factors as type of roads, widths, classes, traffic groups, and service performed; structure data and a section history also are punched into the cards.

These punched cards form a valuable record of road construction and use within the state, and by feeding them into the machine we can produce road logs for distribution to engineers and other personnel. Under manual methods the job of producing these logs would be too time-consuming and expensive.

The same punched cards can be used for preparation of special listings required by foremen, superintendents and other construction personnel in their routine daily work. In addition, these Maintenance Section cards can be used for automatic production of special reports required by the Bureau of Public Roads by first sorting them for the information required and then running the reports on the accounting machine. Under this procedure we can also accumulate totals automatically, thus facilitating preparation of the annual reports.

In the area of cost accounting centralized data processing has proved to be invaluable. Every division of the Department is required to prepare cost accounting records and these records must be correlated into the general ledger of the entire Department. Without centralization this operation would require 16 separate accounting divisions—each virtually a duplicate of the others. Under our present setup, however, detailed cost accounting is done in one office for all divisions. Items covered include costs by activities of work, by routes and sections, by primary and secondary systems and costs of maintenance, replacements and construction. In practice this centralized system provides close control over expenditures and at the same time saves budget dollars for more important work. In addition, because we are giving our engineers detailed breakdowns of costs—a job that could not be done under any manual set-up—we are handing them a tool which helps them better to evaluate the job they are doing.

The cost accounting system is tied intimately to our general and subsidiary bookkeeping procedures. The first step is the preparation of detail punched cards from original documents submitted from the field. These documents are checked, edited, coded and arranged in gen-

• DOCUMENT-originating machine can be used for many jobs, as for preparing detail cards to show weekly earnings.

• THESE high speed machines can interpret, transcribe and extend the information contained in any other punch cards.

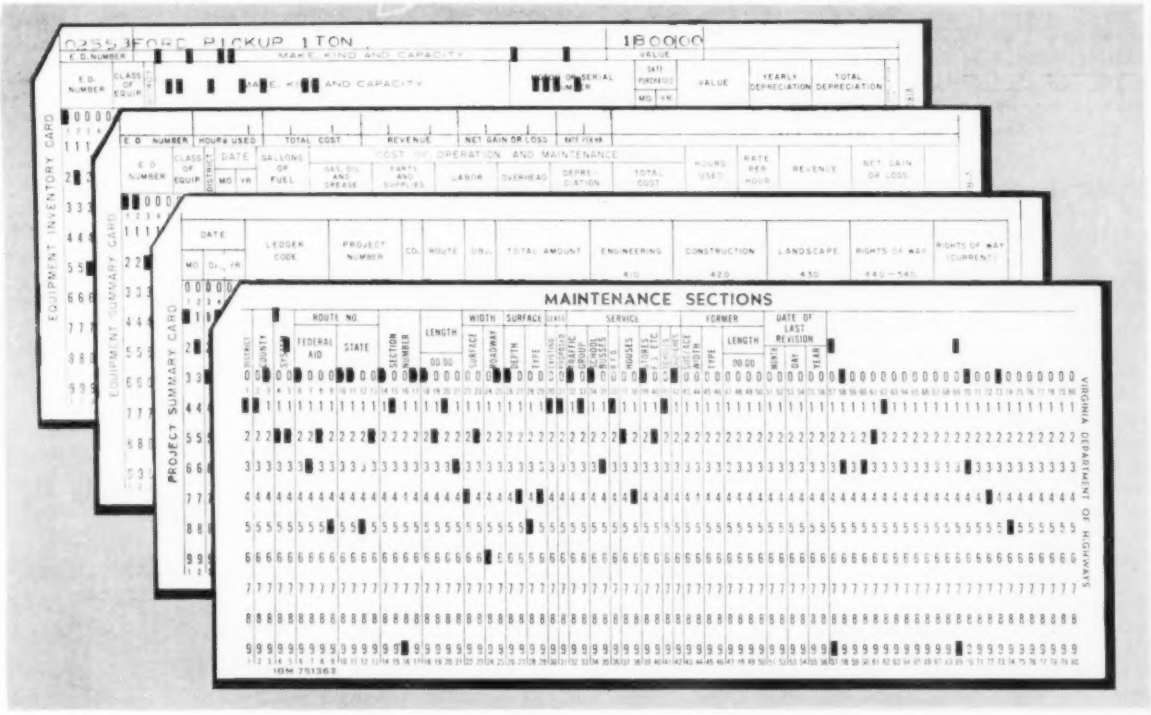
eral ledger code order. Then batch sheets are prepared for each class of document, and with the original documents attached, are forwarded to the Cardpunches where cards are made showing pertinent information —the type of document, date, voucher number, vendor name, equipment division code and object of expenditure. The cards are later used to prepare cash and miscellaneous disbursement registers and general and subsidiary ledger accounts. With these accounts posted automatically, the cards are rerun for the Engineer Cost Analyst to be used in the preparation of special reports to the field engineers.

The net result of these reports is closer control by engineers and other supervisory personnel over operations within the department. By use of the machine-printed reports which show in detail the nature of expenditures and their relation to established budgets, the supervisors can keep close check on spending in their divisions.

In many other ways centralized accounting is advantageous. For instance, from the general accounting records, our section prepares a monthly statement of each Material Stock Account—a record which is forwarded to the field where it is used to reconcile records on those accounts with the general office. Thus we are exercising control from both ends of the operation.

Statements are also prepared monthly on such accounts as Buildings and Grounds, Testing, Outdoor Advertising, Research Division transactions and Geological investigations. Copies of these statements are sent to each office in order to advise them fully on all transactions during the past month and to show the status of their fund at the end of the month. Supervisory personnel are thus able to gauge their operation on the basis of actual totals, rather than roughly estimated figures.

As still further evidence of the value of centralized IBM control over accounting functions, we recently added the tabulation of bids to the list of jobs done by the section. As bids are sent in, the data contained in them is put into punched cards and extended automatically on the IBM 604 Calculating Punch. The extended cards are then processed through the accounting machine where the data are printed onto a master copy



• **DETAILED cost accounting is handled by one office for all divisions; it includes equipment, construction and maintenance.**

used to prepare the monthly trial balance.

The same detail cards are also sorted by ledger code and run through the accounting machine for preparation of semi-monthly registers—with copies going to the field offices showing fund cost by systems, by counties, and by classification of cost. Monthly detail cost analysis sheets are prepared in the same number and they show in detail cost allocations and balances.

Semi-annually special reports are compiled from our file of detail and summary cards from which information is secured to prepare annual reports to the Bureau of Public Roads. Other special tabulations are run to obtain information necessary for our annual reports. In addition, numerous special tabulations are

which is used for running off duplicate distribution copies. This job, which formerly required time and personnel to complete, is now done semi-automatically by the same IBM installation that, among many other things, is used for computing twice-monthly a payroll for up to 6,000 employees and monthly the payroll records of 6,000 others.

In essence, by utilizing 38 people and one complete data processing installation, the Virginia Department of Highways is able to do a thorough processing job for all its divisions, at the same time saving budget dollars. The result is efficiency and accuracy, plus the ability to gain statistics and detailed reports that would almost be impossible to accumulate under any manual method.

A CHECK LIST for Sewage Treatment Plant Design

GEORGE R. ELMORE
and
JOSEPH C. YARBROUGH

A report submitted to the Faculty of the University of North Carolina in partial fulfillment of the requirements for the degree of Master of Science in Sanitary Engineering in the Department of Sanitary Engineering.

ONE OF THE most important considerations in sewage treatment plant design is provision for adequate operation. Designing engineers may have little experience in operation and may be unfamiliar with operators' needs. Perhaps even more regrettable is the lack of an effective means of communication between operators and designers. In the design office much time and work is spent on consideration of operational features; and yet, in many plants, some features desirable for good operation are neglected, either because they were overlooked during the design or because they were not known. A routine systematic check of sewage treatment plant designs might insure better design for operation. This method of checking should be flexible so that new ideas could be added readily. In order to save time the method should be simple. Probably the method best meeting these criteria is the check list.

For some years the Chicago Pump Company has used check lists for examining plans and specifications prior to submitting bids for equipment. Their bids, particularly for smaller plants, have often included the cost of supervising plant operation for some initial period, generally 30 days. From this operational supervision of numerous sewage treatment plants over the United States, the Company engineers have gained considerable valuable experience. It was felt that their experience as distilled in their check lists would be of value to designers. A limited circulation of the check lists among state and design engineers indicates this to be true.

The purpose of this report is to revise and expand the Chicago Pump Company check lists to a form suitable for general use. Other sources also have been consulted, especially the various state standards and the first draft of the Manual of Practice on Sewage Treatment Plant Design, currently being prepared by a joint committee of the American Society of Civil Engineers and the Federation of Sewage and Industrial Wastes Associations. For completeness, some functional as well as operational considerations have been included.

Engineers who use these check lists may find them useful as a form in which individual experience and up-to-date information may be assembled in an orderly manner. Some may find such lists useful as patterns for check lists on treatment units not included here. These check lists can be expected to be useful for anyone interested in sewage treatment plant design, including designing engineers, health department engineers who must approve plans, and plant superintendents and operators.

Check List Arrangement

The basic units of the more commonly used sewage treatment processes have been included in these check lists. In most instances, each unit has been broken down into its component parts, with the items listed thereunder further divided into two functional and operational considerations, where this applies. The first portion consists of *functional* considerations, which are, in general, the criteria that are the bases for the design of the unit. These functional criteria are often specified in standards of State Departments of Health and are available from those agencies, although they vary from state to state and are subject to modification for individual situations.

Following this are the *operational* considerations, which may be incorporated into the design by the engineer. Items listed in this section are the results of operating experiences that have been found to influence the efficiency, safety, and economy of plant operation.

To facilitate the checking of a sewage treatment plant design, a space has been provided after each item on the check lists. However it should be recognized that all of the items do not necessarily apply to any one specific plant, as the check list is intended to serve for various combinations of treatment units.

SEWAGE TREATMENT PLANT CHECK LIST

GENERAL

SEWAGE: Type: Sanitary....., combined.....
Population served: Present....., design.....
Present flows: Minimum.....MGD, average.....
MGD, maximum.....MGD. Design flows: Minimum.....MGD, average.....MGD, maximum.....MGD. Influent: 5-day BOD.....mg/L, suspended solids.....mg/L, industrial wastes.....Effluent requirements: 5-day BOD.....mg/L, suspended solids.....mg/L.

LOCATION AND LAYOUT: Distance to nearest residence....., access road.....Adequate drainage.....Protection against flooding.....
Site fenced....., landscaped..... Guard rails on open tanks.....Potable water supply....., cross-connections....., flushing hydrants for each unit.....Exterior lighting: Walkways....., outside valves....., motor controls....., open tanks....., roadways.....
Provisions for future expansion.....

INLET SEWER: Type....., size....., invert elevation.....Overflow provided.....
Type of measuring device.

CHANNELS AND PIPING: Minimum velocities adequate....., channels aerated.....Dead ends....., can flotage accumulate?....., channel turns rounded.....Valves and gates easily accessible.....By-passes for unduplicated units.....Provisions for sampling.....Long suction lines avoided....., eccentric reducers....., valve bonnets turned up.....
Flanged piping inside....., occasional bell fitting....., wall fittings provided....., sufficient clearance between flanges and wall.....Bell and spigot piping outside.....Hot water piping: vented at high points....., insulated....., drains at low points....., expansion tank provided.....

SERVICE BUILDINGS

SPACE PROVIDED FOR: Offices....., laboratory....., control room....., chemical storage....., toilet....., locker room....., wash room and shower....., eating lunch....., tool room....., shop.....

ARCHITECTURAL: Lighting....., heating....., ventilation....., electricity....., water.....
hot water....., fire protection....., hose bibbs....., floor drains..... Building sewered to..... Space for servicing equipment..... equipment hoist....., doors large enough to pass equipment.....

LABORATORY UTILITIES: Water....., hot water....., gas....., air....., vacuum.....
electricity....., fire protection....., safety shower.....

CONTROL ROOM: Valve controls....., pump controls....., motor controls..... Indicators and recorders: Influent....., effluent.....
recirculation....., return sludge....., pH..... temperature....., air pressure and volume....., gas pressure and volume.....
Disconnect switches to all equipment.

PRELIMINARY TREATMENT

BAR SCREENS: Number..... Type of cleaning: Hand....., mechanical..... Channel width....., depth..... Angle of screen to flow....., bar size..... ins., opening between bars..... ins., effective width....., effective area at design flow....., velocity through screen..... Head loss through screen: Minimum.....
maximum..... Type of control on mechanical rake..... Slab or grating for access when servicing..... Screen width adequate for easy raking....., platform for screenings....., platform drained..... Screening storage.....
method of disposal of screenings..... By-pass....., overflow....., flushing hydrant.....
Channel recesses grouted..... Clearance of enclosure sufficient for unit superstructure..... Explosion proof motors and switches necessary?.....

GRIT CHAMBERS: Number..... Type: Hand....., mechanical....., aerated.....
Size: .....x.....x..... Capacity.....
gals. Detention time: Average design flow.....
peak flow....., present average flow.....
Water level: Maximum..... minimum.....
Velocity: Maximum....., minimum.....
controlled by..... Air supplied by.....

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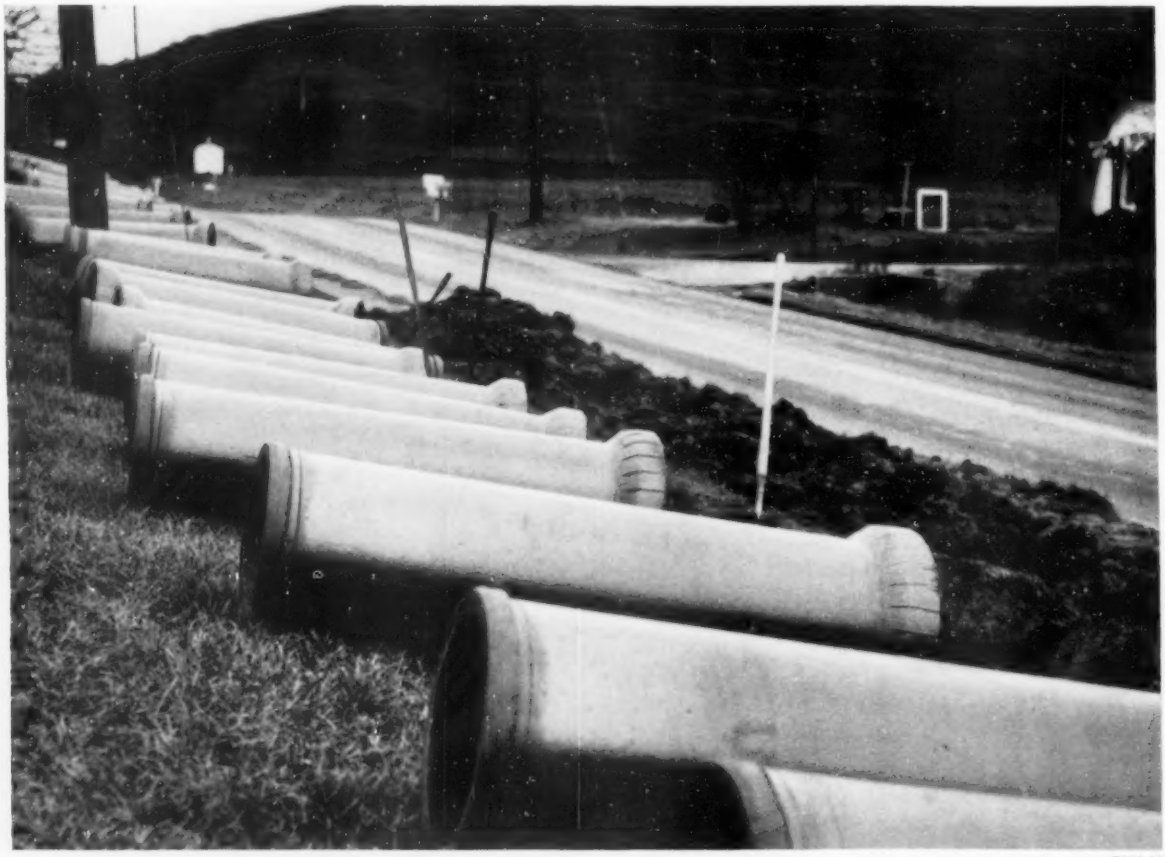

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SEWAGE TREATMENT PLANT CHECK LIST

PRELIMINARY TREATMENT (Cont.)

Method of controlling pressure..... By-pass ..... drain provided....., flushing hydrant ..... Provision for cleaning air diffusers..... Short circuiting avoided..... .... Grit handling: Washed ....., provision for dewatering....., storage provided....., method of disposal....., hoist for grit handling and removal..... Is channel wide enough for grit removal equipment?.....

COMMINUTORS: Size....., type....., number ..... location..... Velocity in inlet channel: Maximum....., minimum....., channel width....., depth..... Water level: Maximum....., minimum..... Head loss: Maximum....., minimum..... Access provided for servicing unit..... Explosion proof motors and switches necessary?..... By-pass....., where to....., overflow....., gates or valves for by-passing..... Drain provided....., flushing hydrant.....

BARMINUTORS: Number..... Channel width ....., depth..... Head loss through screen: Maximum....., minimum..... Bar size....., opening between bars..... Velocity through screen ....., approach velocity..... Water level: Maximum....., minimum..... Access provided for servicing unit..... Clearance of enclosure sufficient for superstructure....., space for power unit..... Explosion proof motors and switches necessary?..... By-pass....., overflow ....., flushing hydrant..... Channel recesses grouted.....

PUMPING STATIONS

STATION PRECEDED BY: Screens....., grit chamber....., comminutor....., measuring and recording device.....

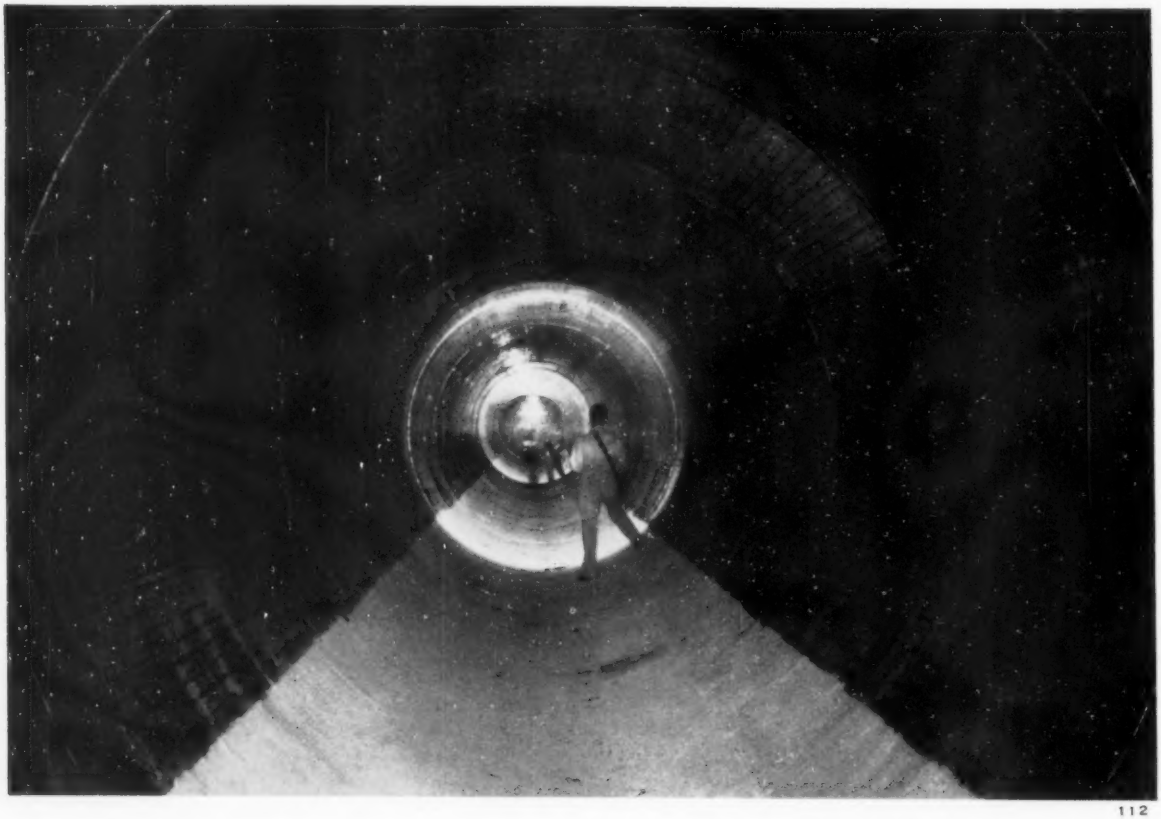
WET WELL: Invert in El..... Water level: Minimum....., maximum..... Length..... width....., depth....., capacity..... Access MH....., MH steps....., ventilation ....., interior lighting....., floor slopes to intake..... Overflow pipe....., size..... invert out El..... Can well be drained?..... to where?..... By-passed?....., to where? ..... Does influent discharge over pump suction? ..... Float tubes remote from inlet and suction lines.....

PUMPS: Number....., capacity....., operating head..... Type of control..... Diameter of suction line....., intake velocity..... Diameter of discharge line....., discharge velocity ..... Invert of intake....., invert of discharge..... Positive suction head..... provisions for priming..... Separate intakes for each pump....., elbows on intake..... Gate valve on intake....., gate valve on discharge ....., check valve on discharge..... Standby pump provided....., capacity....., power ..... Disconnect switch for each pump..... Auxiliary power.....

DRY WELL AND CONTROL BUILDING: Stairs..... forced ventilation....., lighting....., heating....., floor drain....., sump pump..... water-seal pump....., explosion proof wiring ..... Space for: Flow meter....., control panel..... Floor opening for pump removal ....., hoist provided..... Space around pumps for servicing..... Water supply protected against cross connections.....

SEDIMENTATION BASINS

TANK STRUCTURE: Number....., primary..... secondary..... Shape....., area..... depth....., capacity..... Overflow rate ..... gpd/sf, detention time..... Water surface elevation..... Effluent weir length..... weir loading.....gpd/ft. Freeboard..... floor slope..... Surfaces where scum can collect? ..... Can tank be drained?....., where to?..... Can tank be by-passed?....., where to?..... Sludge hopper volume....., hopper side-wall slopes....., bottom dimensions .....x....., can hopper be squeegeed?..... Size of influent channel or pipe....., velocity....., dead-ends avoided?..... Number of inlet ports ....., are ports submerged?..... Inlet baffles....., are baffles submerged?..... Mechanical skimmers provided....., skimming baffles..... Scum trough....., slotted scum collector pipe..... Scum pit....., scum pit drain..... Is effluent weir adjustable?..... Are walkways and guard rails provided?.....



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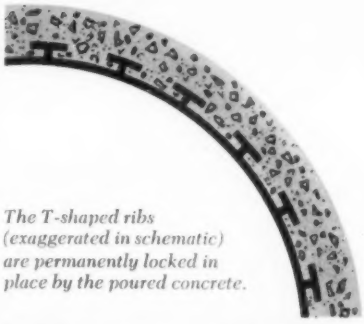
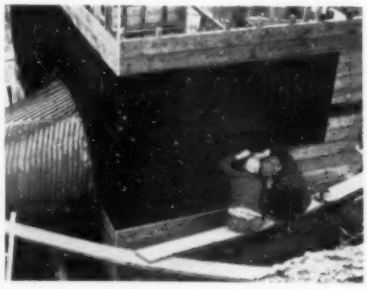


The T-shaped ribs (exaggerated in schematic) are permanently locked in place by the poured concrete.



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SEWAGE TREATMENT PLANT CHECK LIST

SEDIMENTATION BASINS (Cont.)

SLUDGE COLLECTION AND REMOVAL: Mechanical sludge collectors ....., type..... Can sludge withdrawal from each hopper be controlled?..... Sludge well provided....., telescoping draw-off pipe....., can sludge enter well while pumping? ..... Type of sludge pump....., number ....., capacity....., positive suction head ....., type of control..... Air chambers on discharge of plunger pumps?..... Diameter of sludge withdrawal pipe....., sampling valve....., size..... Can air pockets form in sludge suction line?..... Sufficient space for servicing mechanical equipment..... Are pumps interchangeably piped?.....

TRICKLING FILTERS

TANK AND MEDIA: High rate....., standard rate..... Number....., diameter....., area....., depth..... Dosing interval..... recirculation rate....., media depth..... Hydraulic loading: max.....mgad, min..... mgad. Organic loading: max.....lb./day/acre ft., min.....lb./day/acre ft. Type of media....., size..... Invert elevation out..... Flow measuring device..... By-pass piping....., provisions for flooding.....

UNDERDRAINS AND COLLECTORS: Area of inlet openings.....,percent, slope of floor....., cross-sectional area....., materials..... Slope of effluent channel....., cross-sectional area ....., velocity of flow..... Is ventilation provided?....., access to effluent channel....., provisions for flushing underdrains.....

DISTRIBUTOR: Discharge head..... Size of orifices....., spacing..... Clearance between arm and media..... Are orifices adjustable? ..... Dump gates at ends of arms....., drain for dewatering.....

AERATION TANKS

TANK STRUCTURE: Type of aeration....., number of tanks..... Length....., width....., depth....., volume....., detention time ..... Water surface elevation....., freeboard..... Can tank be drained?....., bypassed..... Type of diffuser hoist....., is walkway suitable for hoist?....., adequate clearance for raising diffusers..... Can influent be controlled?..... Provisions for froth control: Water spray pipe....., chemical feeders..... Effluent weir length....., loading.....gpd/ft., is weir adjustable?....., will weir flood? ..... Velocity in effluent channel....., is it aerated?..... Flushing hydrant nearby.....

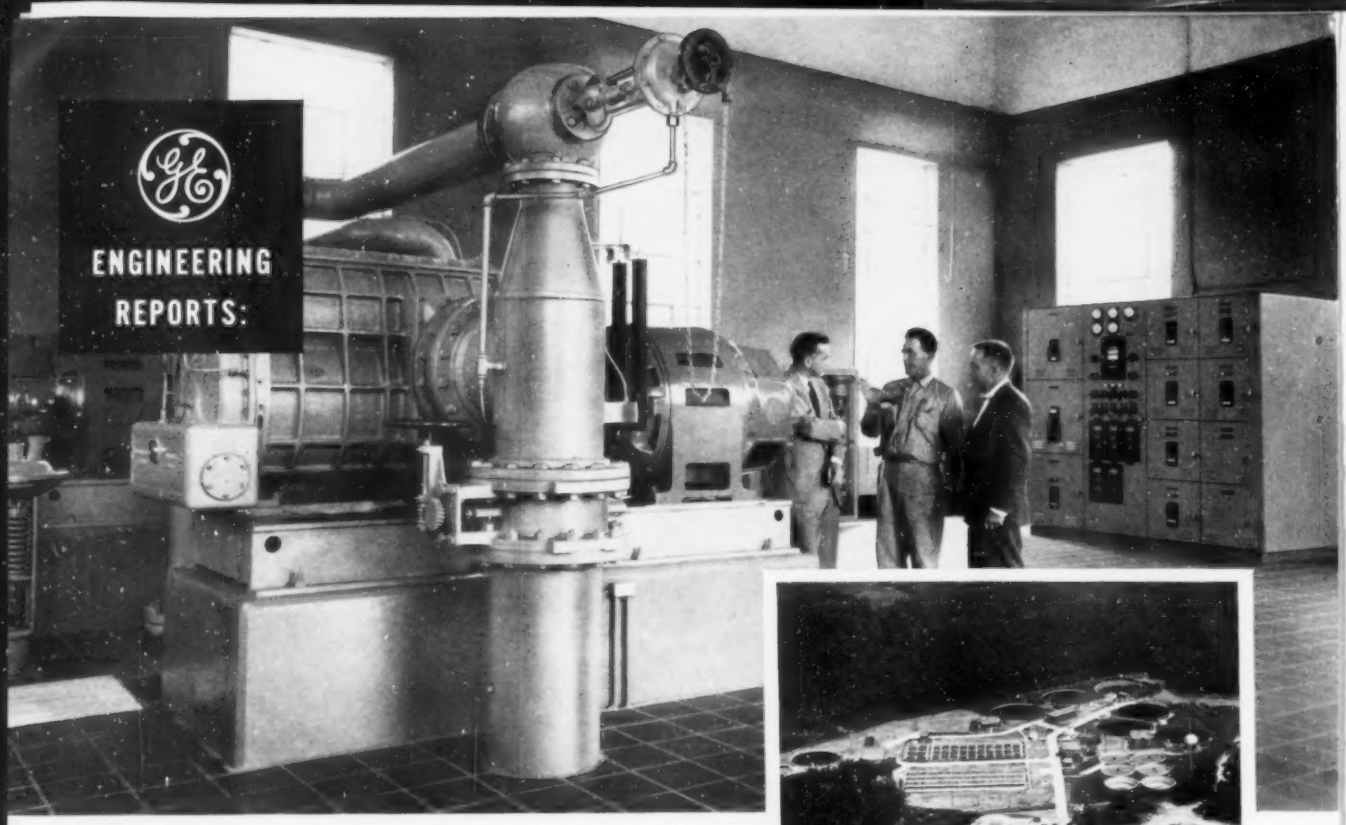
INFLUENT CHANNEL: Width....., depth....., freeboard..... Minimum velocity....., is channel aerated?..... Dead-ends avoided....., provisions for scum removal..... Are inlet ports submerged?....., velocity through ports....., do inlet ports discharge against diffuser tubes?..... Is channel provided with: drain....., flow measuring device....., by-pass connection..... Can primary tank be by-passed to aerator?.....

RETURN SLUDGE: 5-Day BOD of influent..... mg/L, weight.....lbs. Weight of return sludge .....lbs. Percent of waste flow..... Mixed-liquor solids concentration....., weight of total solids..... Is sludge division box provided? ..... Returned sludge reaerated....., chlorinated..... Point of sludge return..... Type of sludge pump....., capacity....., positive suction head..... Diameter of sludge pipe....., velocity..... Can return sludge be observed?....., sampled....., controlled. ..... Standby pump provided....., measuring and totalizing device.....

DIFFUSERS: Type of diffuser....., material....., permeability..... Diffuser plate area..... Maximum diffuser tube spacing....., height above floor..... Flow pattern in tank....., transverse velocity....., longitudinal velocity.....

AIR PIPING AND BLOWERS: Number of blowers....., type....., capacity....., standby..... C. F. air/100 mg/l BOD....., C. F. air/gallon of sewage..... Air discharge rate....., can output be regulated?..... Suction velocity....., discharge velocity..... Air relief valve....., operating air pressure..... Friction head loss ..... Shut-off valve on discharge....., check valve..... Type of air filters....., is head loss measured?....., are silencers provided on intakes?..... Blower foundation isolated from

ENGINEERING REPORTS:



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New General Electric Equipped Treatment Plant Doubles Sewage Capacity for Growing Charlotte, N.C.

To meet area needs for adequate sewage disposal, Charlotte, N.C., recently doubled capacity of Irwin Creek Sewage Treatment Plant. A $2 million expansion enables plant treatment of 12 million gallons of industrial and residential sewage daily.

Engineering assistance and major electrical equipment were supplied by General Electric. Working closely with City officials, consulting engineers J. N. Pease and Co., who designed the addition to original plant, and electrical contractor R. H. Bouligny, Inc., G-E engineers facilitated installation, start-up of electric equipment at the plant site.

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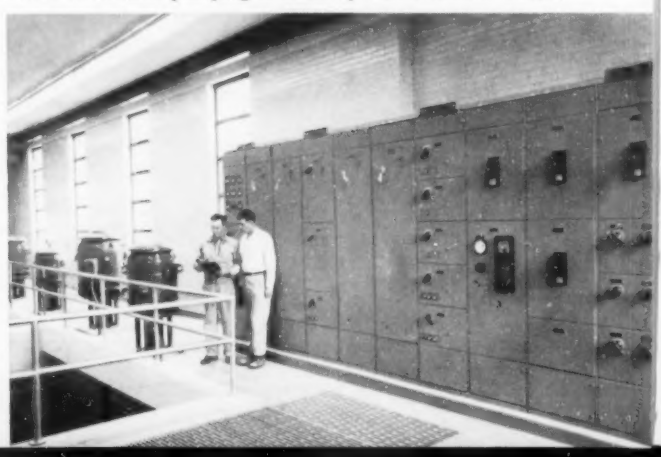

SEWAGE TREATMENT PLANT CHECK LIST

AERATION TANKS (Cont.)

floor..... Size of air main....., velocity ....., head loss..... Size of laterals..... valves....., regulators..... Air meter for each tank....., manometer on air main..... Are interiors of pipe coated?.....

CHLORINATORS

BUILDING: Separate building....., chlorine room isolated....., access only from outside..... Doors open out....., louvered at bottom..... Forced ventilation....., air changes per minute ....., fan control on outside..... Fixed observation windows..... Storage space for cylinders....., hoists....., scales..... Provisions for heating.....

CONTACT TANK AND FEEDERS: Tank capacity..... contact time..... Chlorine residual....., gas withdrawal rate..... Tank provided with: drain....., by-pass....., baffles..... flow measuring device..... Type of feeder....., type of feeder control..... Feeder-pipe material ..... Water supply protected against cross-connections.....

DIGESTERS

STRUCTURE AND EQUIPMENT: Type: High rate ....., standard rate.....; heated..... unheated.....; primary....., secondary..... Number of units..... Depth ....., diameter....., capacity..... Sludge volume.....cf/cap., digestion time..... Freeboard....., type of cover..... Access manholes in roof....., MH steps into tank....., MH in sidewalls....., gas and water tight MH covers provided..... Ladder to roof....., lights on roof..... Supernatant overflow pipe ....., vented against siphonage..... Supernatant selector on draw-off pipe....., discharges to..... Sludge draw-off pipe: Size....., distance from inlet....., discharges to....., flushing connections provided....., type of sludge valves..... Floor slope..... Provisions for breaking up scum....., provisions for sludge stirring or recirculation..... Is thermometer well provided?..... Can tank be by-passed?..... drained?..... Is lagoon available for emergency use?.....

HEATING: Sludge temperature....., BTU/Hour required..... Type of heat exchanger..... hot water or steam..... Boiler capacity..... circulating pump capacity..... Sufficient space for cleaning heat exchanger..... Expansion tank ....., are high points in water lines vented? ..... Automatic controls....., automatic mixing valve..... Thermometers..... Make-up water pressure regulating valve.....

GAS COLLECTION AND UTILIZATION: Gas utilized ....., wasted..... Capacity of burner ..... Maximum gas pressure....., pressure relief valves....., vacuum-breaker valve..... Gas lines: diameter....., condensate traps....., manometers....., meters....., flame traps ..... Gas holder: type....., capacity ....., no. of compressors.....

GALLERY: Lighting....., ventilation....., explosion-proof wiring..... Sampling sink....., liquid level indicator....., sludge temperature indicator..... Flushing hydrant....., floor drain....., sump pump....., discharges to..... Adequate pipe clearance....., piping color coded.....

SLUDGE DEWATERING

DRYING BEDS: Number....., total area....., sf/capita..... Elevation of top of sand....., freeboard..... Depth of sand....., depth of gravel..... Slope of sludge discharge pipe ....., vented for draining..... Slope of distribution channel....., does it drain?....., stopgates to eliminate dead ends..... Distribution valves....., splash plates..... Height of sludge discharge above sand..... Underdrains: size....., spacing....., slope..... vented..... Underdrainage returned to..... Provisions for removing sludge..... Are beds covered?.....

MECHANICAL DEWATERING: Raw sludge....., digested sludge....., number of filters....., size....., total area..... Chemical storage: Iron....., lime..... Chemical feeding: Iron....., lime..... Disposal of filtrate ....., handling cake..... Disposal of cake: Incineration....., drying....., other.....

Butler County Highway garage building at Wyocena, Wisconsin

220-ft. long clear-span interior makes parking easy.

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These pictures show how Butler clear-span design provides 100% usable inside space. There is more room to move and store bulky road machinery. And you can see how Butler rigid-frame construction permits conversion of a whole wall to wide, overhead doors without special structural support.

What you can't see is the preliminary engineering that goes into Butler buildings to make them meet local codes and building laws—relieving your own staff of much routine engineering. Each metal part is precision die-formed for perfect fit, yet mass-produced in Butler factories to keep prices down. Faster, bolted assembly saves time and labor as well as materials.

Some State and County officials save even more time and money by standardizing on Butler buildings—ordering new construction like road machinery, virtually from their desks.

Call your nearby Butler Builder. He's under "Buildings" or "Steel Buildings" in the Yellow Pages of your phone book—invite him to bid on your next job.

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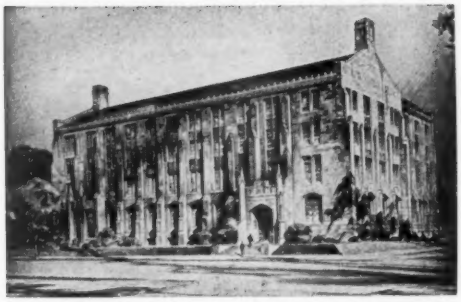
APWA News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

1958 Public Works Congress and Equipment Show at Kansas City

In announcing the 64th Public Works Congress and Equipment Show for Sept. 28-Oct. 1, the General Chairman, Reed McKinley, Director of Public Works for Kansas City, Mo., says: "The big exhibition of equipment, materials, and supplies, as well as all technical sessions, will be held in the Municipal Auditorium which is located in the heart of our city—only 7 minutes from Municipal Airport or from Union Station. The Muehlebach, which will serve as Headquarters Hotel, is ideally located across the street overlooking the beautiful plaza which covers our 1,500 car underground parking garage. Other hotels are only two to three blocks away.

"The Local Committee, together with the officers and staff of our Association, has put forth a great deal of time and effort to make this a very worth while meeting for all persons concerned with public works activities. Note, if you will, the large number of topics to be discussed. The Equipment Show will be something you cannot afford to miss.

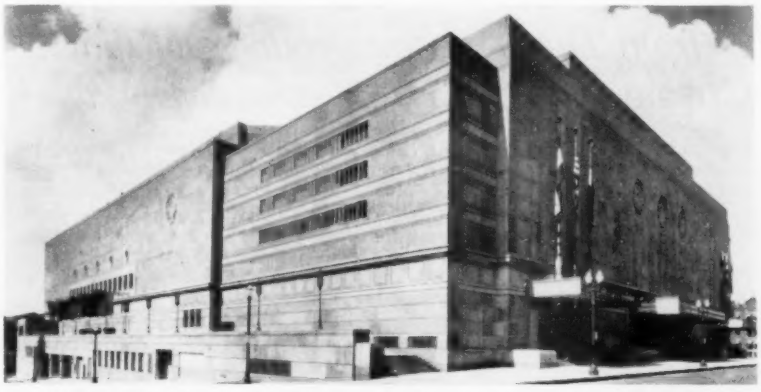
"We will certainly look forward to seeing you and assure you that everything will be done to make your stay a very profitable and enjoyable experience."

Program Highlights

On the first day delegates will be registered and a 1½ hour scenic tour of Kansas City will be available. In the evening a get "Acquainted Party" will be held in the Grand Ballroom, Hotel Muehlebach. The Congress will be opened on Monday, September 29, with Sol Ellenson, President of the American Public Works Association presiding. Following a special luncheon for program participants the Monday afternoon sessions will include the following panels:

Streets and Highways in Urban Areas—Chairman: John G. Duba, Mayor's Administrative Officer, Chicago, Ill. Topics and their commentators: "State Responsibility for Highways in Cities," L. P. Zimmerman, Commissioner of Highways, State of Minnesota; "Utility Uses of Streets & Highways," Frank E. Randall, Right-of-Way Superintendent, Pacific Telephone & Telegraph Co., Los Angeles, Calif.; "Economic Impact of Urban Expressways," Fred J. Benson, Dean of Engineering, Texas A. & M.; and "Administration of the Federal Highway Program," James C. Allen, Asst. Commissioner for Administration, Bureau of Public Roads.

Collection and Disposal of Solid Wastes—Chairman: J. D. Wright, Director of Public Works, Lynchburg, Va. Topics and tne commentators: "Contract Method of Refuse Collection," D. A. Anderson, Assistant City Engineer, Maintenance & Operation, Seattle, Wash.; "Layout and Scheduling of Refuse Collection Routes," R. W. Neilson, Director of Public Works, Winston-Salem, N. C.; "Compaction and Settlement of Sanitary Landfills," Theodore E. Winkler, Engineer of Waste Disposal, Dept. of Public Works, Detroit, Mich.; and "Design & Operation of Municipal Incinerators," Carl Schneider, Consulting Engineer, New Orleans, La.



● **MUNICIPAL Auditorium at Kansas City, Mo., will house 1958 APWA Congress.**

OFFICERS: Sol Ellenson, Newport News, Va., *President;* Wm. D. Hurst, Winnipeg, Manitoba, Canada, *Vice President.* **REGIONAL DIRECTORS:** (term ending 1958) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (term ending 1959) Albert G. Wyler, New Orleans, La.; Edward J. Booth, Bismarck, N. D.; Frederick Crane, Buffalo, N. Y.; (term ending 1960) Charles W. Cooke, Hartford, Conn.; R. S. Hopson, Richmond, Va.; H. H. Hester, Fort Worth, Texas. *Immediate Past President,* Robert Anderson, Winnetka, Ill. Robert D. Bugher, *Executive Director*

This air view of the City of Tacoma, Washington shows a portion of the industrial area in the foreground with the business district and Commencement Bay in the background. The detail illustration at right, shows a typical cluster of Crispin Air Valves in a Tacoma installation.

"...installed in 1913
...good for another 45 years..."

from Tacoma comes your proof that
Crispin AIR VALVES *are dependable!*

Here is your *advance* proof that Crispin Air Valves will give you dependable service *for years*. Mr. J. A. Kuehl, Superintendent of the Water Division, Department of Public Utilities, City of Tacoma, Washington puts it this way . . .

"It may be of interest to you to know that the City of Tacoma, Department of Public Utilities, Water Division, has been using Crispin Air Valves on its 40 miles of supply line since its inception during the year 1913. Maintenance on these valves has amounted to the replacement of seats and floats occasionally and they appear to be good for another 45 years of service."

Crispin Air Valves have these important advantages—simplified construction, easy accessibility, maximum durability, minimum maintenance and thoroughly efficient operation. The records of the City of Tacoma prove the value of these advantages.

We invite you to write, wire or phone our offices for detailed information on dependable Crispin Air Valves . . . your inquiry will receive prompt attention.

AIR CONTROL VALVES • FOR OVER 45 YEARS

multiplex
MANUFACTURING COMPANY
BERWICK, PENNSYLVANIA
Dept. C

Municipal Sewerage and Drainage Systems—Chairman: John Kehr, Executive Director, Metropolitan Sewer District, St. Louis, Mo. Topics and their commentators: "Internal Sewer Surveys," Arthur D. Caster, Principal Sewage Disposal Engineer, Dept. of Public Works, Cincinnati, Ohio; "Design of Sewer Inlets," Carl F. Izzard, Chief Drainage Engineer, Bureau of Public Roads; "Sewer Odor Production and Its Biological Control," George Reid, Professor, Sanitary Science, Univ. of Oklahoma; and "Catch Basin & Sewer Cleaning," Howard Biggs, Chief Sewer Engineer, Fort Wayne, Ind.

Louis Moehr, City Engineer, Wyandotte, Mich., will preside at the General Session at 9 A.M. on Tuesday morning. At this session W. J. McCarter, General Manager, Chicago Transit Authority, will speak on "Public Responsibility for Mass Transit Service," and Lee Rothergy, Associate Engineer, Institute of Traffic and Transportation, University of California, will discuss "Curb, Driveway and Sidewalk Regulations." Lloyd Knapp, Commissioner, Department of Public Works, Milwaukee, Wisc., will preside at the 11 A.M. session. Two papers will be given on the following topics: "Public Works Aspects of Urban Renewal Programs" by Joseph H. Ehlers, Assistant Commissioner, Technical Standards & Services, Urban Renewal Administration; and "How to Get Things Done Through Others" by Herbert W. Starick, City Manager, Dayton, Ohio. The afternoon sessions will be as follows:

Maintenance of Municipal Streets—Chairman: Carl Fagerlind, Street Commissioner, Waterloo, Iowa. Topics and their commentators: "Pavement Condition Surveys," Jack H. Gould, Consulting Engineer, DeLeuw, Cather & Co., San Francisco, Calif.; "Patching and Resurfacing," George Fisher, Director of Public Works, Omaha, Nebraska; "Street Cleaning & Snow and Ice Removal," Harold D. Bradley, Commissioner, Dept. of Public Works, Toronto, Ont., Canada; and "Traffic Markings, Signs and Signals," E. V. Avery, Traffic Engineer, Dept. of Public Works, St. Paul, Minn.

Purchase and Care of Public Works Equipment—Chairman: Edward J. Booth, City Engineer, Bismarck, North Dakota. Topics and their commentators: "Governmental Buying Procedures," Joseph Rose, Director of Public Works, Evanston, Illinois; "Preventive Maintenance of Equipment," Capt. J. R. Davis, CEC, USN, Bur. of Yards

SPEEDS CAST-IRON PIPE INSTALLATION

Marcelletti & Son doubles daily production with fast-digging Cleveland

A fast-digging Cleveland 110 trencher enabled Emil Marcelletti & Son of Bedford, Ohio to make the most of the speedy pipe-laying made possible by new quick-connecting, bell-and-spigot type cast-iron pipe on this water line installation in North Ridgeville, Ohio.

Marcelletti's daily production, before putting the Cleveland on the job, had been limited because the backhoe method he was using didn't open trench fast enough to stay ahead of the swift moving pipe-laying operation. The 110 quickly doubled his daily production, on some days turning out nearly 3 times the trench footage he had been getting.

"The 110's high, reliable production and its ability to get by obstructions in narrow quarters really paid off for us on this job," says Jim Marcelletti, secretary-treasurer of the firm. "It's quick-shifting conveyor let it dig right by hundreds of trees, poles and hydrants along the trench line, obstructions that had previously slowed up our trenching operations."

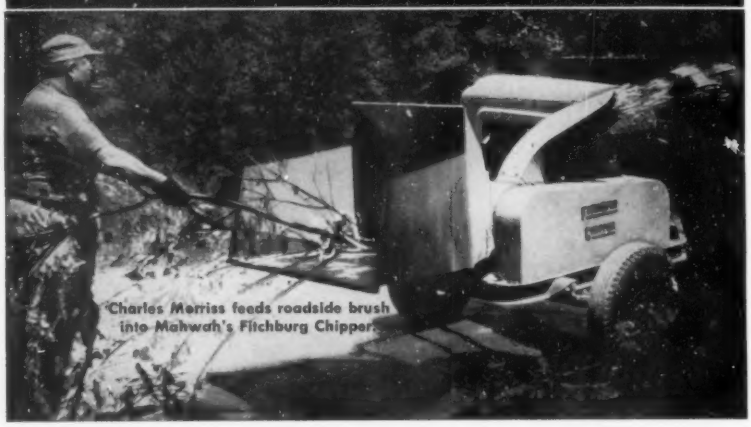
accurate • fast • dependable • clean
—there's nothing like a Cleveland for trenching

Good Everywhere ®

The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio

INSTANT BRUSH DISPOSAL
FITCHBURG CHIPPER
DOES 3 MEN'S WORK



Charles Merriss feeds roadside brush into Mahwah's Fitchburg Chipper

When you want to cut brush disposal cost, investigate a Fitchburg Chipper, a real time and labor-saver.

John Glasgow, Superintendent of Public Works, Township of Mahwah, New Jersey, says: "Now I chip brush instead of putting it on piles and waiting for wet weather to burn. I mention wet weather because of fire hazard.

"The Fitchburg Chipper was purchased in May 1954. It will take only a short time to pay for itself. I hired 6 men to cut and clean up brush, now with the Chipper I only need 3 to do the same work."

You, too, can save man hours where there is a need for line clearance operations, road clearance, thinning out woodlots, or handling the brush problem on parkways, city streets, etc.

The Fitchburg Chipper is designed for rugged use, and in models priced from $960 upward.

Learn about Fitchburg's exclusive spring-activated feed plate, which makes chipping of all sizes of wood (up to the machine's rated capacity) simple. Another exclusive feature is the hinged feed apron which can be closed when not in operation.

Read how others cut labor costs with a Fitchburg Chipper—the only chipper that gives you a one-year guarantee.

Send For New Free Booklet-"**CHIP DOLLARS FROM YOUR OVERHEAD.**" Complete with cutaway color drawings of Chipper in action. Specifications, etc.

FITCHBURG ENGINEERING CORPORATION

Department PW-98, Fitchburg, Massachusetts

Send my free copy of "Chip Dollars From Your Overhead" to:

Name_____ Position_____

Address_____

Town or City_____ State_____

& Docks, Dept of the Navy, Washington; "Municipal Garage and Shop Facilities," Louis L. Drasler, Director of Public Service, Cleveland, Ohio; and "Economic Utilization of Equipment," L. E. McCorison, Superintendent, Equipment Div., Dept. of Public Works, San Diego, Calif.

Design and Maintenance of Public Buildings—Chairman: John Morin, City Engineer, Oakland, Calif. Topics and their commentators: "Trends In Design of Municipal Buildings," Douglas Haskell, Editor, Architectural Forum, New York, N. Y.; "Maintenance and Modernization of Buildings," Walter Myers, Assistant City Engineer, Bldg. Maintenance Section, Dept. of Public Works, Kansas City, Mo.; "Planning and Scheduling of Cleaning Operations," Walter Detmar, Director, Property Management Division, Dept. of Public Works, New York, N. Y.; and "Building Maintenance Records and Reports," William L. Guardia, Chief Planner and Estimator, Div. of Public Buildings, New Orleans, La.

Evening entertainment will include Chapter dinners and a special motion picture program at 8:30 P.M.

At the 9 A.M. General Session on Wednesday, William Bowes, Commissioner of Public Works, Portland, Oregon, will preside. Paul D. Haney, Black and Veatch, Consulting Engineers, Kansas City, Mo., will speak on "Water Pollution Control Developments" and Ray Nixon, Chief of Construction, Atlanta, Georgia, will talk on "Inspection of Public Works Construction." Robert Hopson, Director of Public Works, Richmond, Va., will preside at the 11 A.M. session. A paper on "Stand-By Plans for Emergencies" will be given by William E. Crockett, Director, Natural Disaster Office, U. S. Office of Defense and Civilian Mobilization, Battle Creek, Mich., and one on "Accident Prevention Programs for Public Employees" by H. P. Goodin, Director of Safety, Minneapolis, Minn.

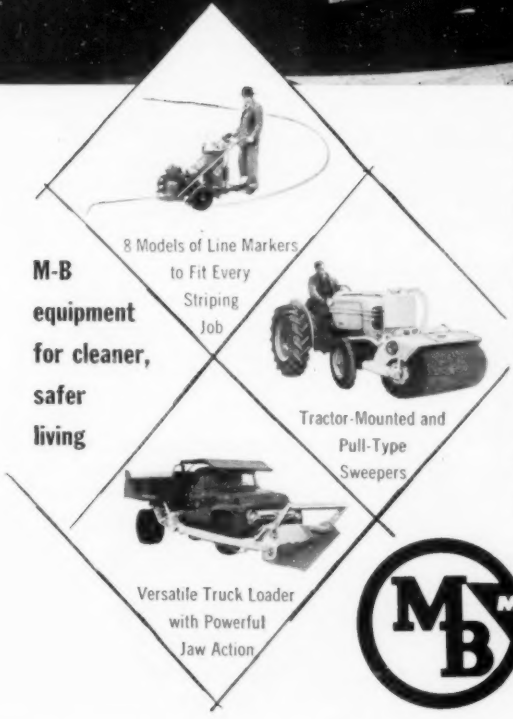
At the 2 P.M. session a Symposium on Urban Expansion will be presented with Roy Owsley, Consultant to the Mayor, Louisville, Kentucky, as Chairman. The speaker will be George H. Deming, Director, Conference on Metropolitan Area Problems, New York, N. Y. and the commentators are as follows: Kenneth K. King, Director of Public Works, Phoenix, Ariz.; Harold K. Schone, Director of Public Works, Oakland County, Pontiac, Mich.; D. C. Wesche, City Manager, Manhattan, Kansas; and Warren Smith, Sanitary Engineer, U. S. Public

Now... *every* city can afford modern collection equipment

▲ What a payload! M-B's pack anything — have fast, safe, complete "push-out" unloading — no dumping.

▼ Wide side doors for step-saving, safe curb side loading — bulky objects loaded easily, too.

M-B equipment for cleaner, safer living


8 Models of Line Markers to Fit Every Striping Job
Tractor-Mounted and Pull-Type Sweepers
Versatile Truck Loader with Powerful Jaw Action

Today there's no need for any city to be without modern refuse collection equipment. Because of simplified, weight-saving, clean design and resulting lower truck cost, very often *three* M-B Packers can be purchased for the price of *two* complicated hydraulic compactors of the same rated size. And savings only begin there—less dead weight and far fewer packing cycles mean real gas economy and low maintenance costs. ▪ Consider, too, the high quality built into these units—extensive use of high tensile steel—a rugged, stabilized packing plate—dependable two-cable drive combined with an efficient, over-size electric clutch—and important, *exclusive* safety features. ▪ Economical M-B Packers offer the same quality features in all sizes—14 to 24 cu. yd. truck mounted; 32 and 38 cu. yd. Trail-Pack, self-powered trailer type models; and in the M-B container-loader-packer system for "containerized" refuse handling. There's an M-B distributor near you—call him or write us today for complete details.

M-B CORPORATION
NEW HOLSTEIN, WIS.

MANUFACTURERS OF QUALITY MUNICIPAL AND CONSTRUCTION EQUIPMENT *since* 1907

Health Service. Drawing of attendance prizes will be at 4 P.M. and a reception at the Muehlebach Hotel, courtesy of the International Harvester Company, will be held at 6. P.M. The Annual Dinner of the APWA will be at 7:30 P.M. at the Muehlebach Hotel.

• • •

Maintenance Costs for County Highways

Maintenance expenditures for 1957 on the 1,251.83 miles of primary and local roads in Van Buren Co., Mich., cost $449,849.39 or 75.9 percent of the Motor Vehicle Highway Fund income. The primary system, which consists of 317.15 miles, expended $181,579.49 or $572.54 per mile, while the local road system of 934.68 miles expended $268,269.90 or $287.02 per mile.

An analysis of the expenditures follows: $41,570 was spent on the road bed, which includes berming, surface drainage and shoulder maintenance. To facilitate drainage, approximately 4,018 feet of ditches were excavated and cleaned out. Five bridges were replaced with metal culverts, and on five other bridges, new creosoted decking was installed; 4,885 feet of corrugated metal culvert was used for crossovers and roadside drainage; and 3,651 feet of concrete pipe was installed along the roads for drainage. The total cost, which includes the general bridge maintenance, was $29,462.

The winter of 1957 brought an average snowfall of 50 inches. The cost for its removal was $35,634, while salt and chloride applications cost $25,071.

Replacing and refinishing road signs and markers was continued and 700 reflectorized portal signs were installed on all bridge and large culvert crossings. To further the county's street-numbering program, installations have been completed in two townships. The cost of these traffic services was $19,655.

Roadside brush cutting and tree removal are a part of the winter program. Most of the brush cutting is performed by prisoners and welfare workers. Dead and cull trees, which may result in possible injury to the traveling public, were removed. Since the initiation of this practice, a decided reduction has been noted in the annual summer windfalls. This part of the program has cost $74,158.

Gravel maintenance has cost the county $48,985. Gravel patching has cost $26,803, while gravel surfacing has required $32,511; $73,117 was expended to repair the present asphalt roads, a total of 524.42 miles (of which 244.82 miles are inadequate); 43 miles of primary and local roads have been resurfaced with a bituminous seal-coat application at a cost of $42,884. Maintenance is only a temporary improvement. To reduce the expense of maintenance, the inadequate roads need to be reconstructed to take care of the present and predicted traffic volume.

• • •

Aluminum Quicklock Pipe Line for Air Supply

In the construction of Glen Canyon dam on the Colorado River, Mountain States Construction Co. suspended a Wade Quicklock all-aluminum portable pipeline 700 feet vertically from the canyon edge to water level. First air line on the job, the six-inch pipe was hung virtually free down the face of the canyon wall. The aluminum construction permitted easy handling regardless of the terrain and the lines carry either air or water at both high and low pressures.

New!... Tassco increment sheet sign

low initial cost
low erection cost
lowest maintenance cost

Here's a new all-aluminum sign developed especially for the large signs required on major expressways. The "Increment Sheet Sign" consists of aluminum increment sheets hung vertically on a supporting frame. It can be made in any height or width, and for ground or overhead installation. Each sheet engages with the adjacent sheet, providing a smooth-faced sign panel.

The advantages are obvious; new lows in the cost of material, installation and maintenance. The aluminum never needs painting or other costly maintenance. Erection is quick and easy. Reflective materials or painted backgrounds are available in any type letters or symbols. As for strength, the sign above, on New Jersey's Garden State Parkway, is designed to withstand wind in excess of 100 m.p.h.

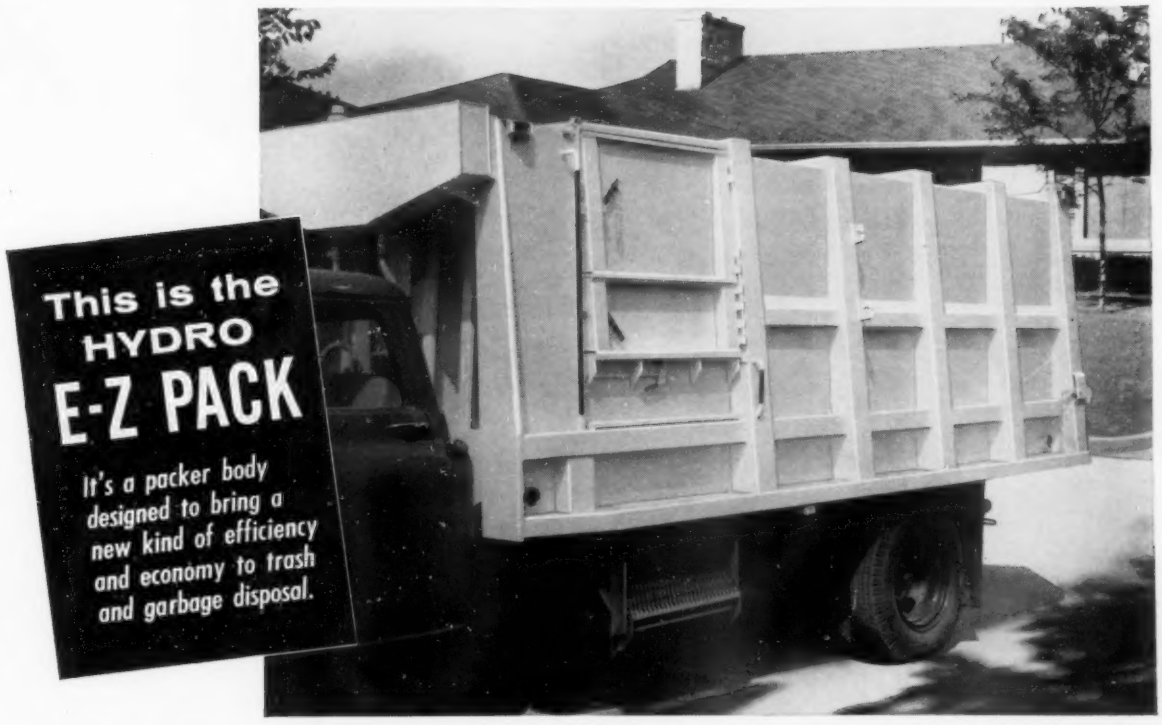
Send today for new pamphlet with full engineering data.

ONE RESPONSIBILITY TOO

Through our associate company, Pfaff & Kendall, Tassco can offer a complete range of standards and supports for ground signs and overhead spans to meet any requirement.

TASSCO

TRAFFIC & STREET SIGN COMPANY
84 Foundry Street, Newark 5, N. J.


This is the
HYDRO
E-Z PACK
It's a packer body designed to bring a new kind of efficiency and economy to trash and garbage disposal.

Hydro E-Z Pack customers wrote this advertisement!

J. Ted Tharp, Mt. Vernon Garbage Co., Mt. Vernon, Ohio
"We service about 1800 homes and several commercial accounts with three men in a 30-hour week. We particularly like the fast-opening back door and the fins in the top. Our next body will be an E-Z Pack."

C. Elmer Coulter, Peoria Disposal Co., Peoria, Illinois
"Just completed a cost analysis on our five Hydro E-Z Pack units compared to other packer-type bodies. On one account for 31-day period, savings were: 34 loads vs. former 102 loads; labor $136; mileage 1360 miles; gasoline 240 gallons; oil 5 quarts. After allowances for truck and tire wear, we came up with actual monthly savings of $227.20 on this one account. We figure one E-Z Pack replaces three other-type units."

H. W. Johnson, City Manager, DeLand, Florida
"Watertight body eliminated all complaints due to loss of fluid from garbage. We haul in one E-Z Pack load what formerly required seven large open truck loads."

Stanley J. Twardus, Newark, Delaware
"I intend to buy another E-Z Pack in the near future because the company stands behind the product. I have two now."

Russell Snow, V.P., Refuse Service, Inc., Battle Creek, Mich.
"It packs garbage well, is well constructed, has a pleasing appearance and side-loading feature is less hazardous to our employees."

Philip Lehl, Jr., Portland, Oregon
"Like it very much . . . not a thing it won't handle. No maintenance expense either."

C. J. McElligott, Asst. Mgr., Oco Waste Paper Co., Cleveland, Ohio
"It handles with ease what we formerly loaded into a 32′ van body. One E-Z Pack load equals four 14′ stake body loads. In reducing bulk, it has no competitor."

Adam Schleining, Santa Ana Commercial Co., Santa Ana, Calif.
"Absolutely no maintenance problems of lost time while operating 17 E-Z Pack units in three cities. One man picks up 350-400 stops per day, makes fewer trips to dump."

Hydro E-Z PACK

WHAT MORE CAN WE SAY?

. . . except that Hydro E-Z Pack, the modern disposal method, can do all these things for you, too. Write today for full details.

HYDRO E-Z PACK EZ-558

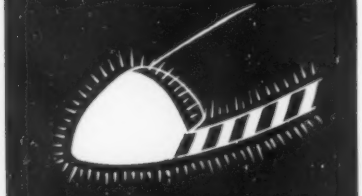
HYDRO E-Z PACK DIVISION–HERCULES GALION PRODUCTS, INC., GALION, OHIO

Superior Design, Construction and PERFORMANCE
far greater strength and SAFETY!
AMERICAN
Approved
PLAYGROUND AND SWIMMING POOL EQUIPMENT
The wise choice of experienced buyers for nearly half a century.
WRITE FOR LITERATURE
AMERICAN
PLAYGROUND DEVICE CO.
ANDERSON, INDIANA, U.S.A.
WORLD'S LARGEST MANUFACTURERS OF FINE PARK, PICNIC, PLAYGROUND, SWIMMING POOL AND DRESSING ROOM EQUIPMENT

YOUR Partner IN Safety

FLEX-O-LITE

Type H Safety Spheres



Tops in effective glass bead reflectivity—day or night. Easy to apply with ordinary traffic paint at just pennies per square foot. Full-time protection for utmost safety. Write for details.

FLEX-O-LITE MFG. CORP.
8301 Flex-O-Lite Drive
P.O. Box 3066 (Affton Br.), St. Louis 23, Mo.

"DINOSAUR" REFUSE CONTAINERS HANDLE 40-CUBIC YARD LOADS

DETACHABLE containers, up to and over 40 cubic yards capacity, are employed in a new system of materials handling just developed by Dempster Brothers of Knoxville, Tenn. Basic advantages of the new system, called the Dempster-Dinosaur, are: Larger capacity containers, better weight distribution; loads to 30,000 pounds; complete hydraulic operation without use of winches, sheaves, telescopic cylinders, cables or chains; all pick-up and handling operations performed without the driver leaving the truck cab; and ability to put containers on and off docks.

Two models are now available for over-the-road use—one handles 22,000 pounds and the other 30,000 pounds. Maximum height and length of container are limited only by state regulations.

Primarily, use of the Dempster-Dinosaur in the municipal field will be for handling volume accumulations of trash and refuse. Where long-haul situations exist the containers can act as portable transfer storage stations.

Mechanically, the Dempster-Dinosaur is of extremely simple design. Components are a tilting frame, two hydraulic raising and lowering cylinders and a double-acting bail cylinder, which pulls the containers up the tilting frame with a ratcheting action against recessed hooks spaced at intervals under the container. At its destination, the load can be dumped or the container can be put down on the ground or pushed off onto a dock by automatically reversing the ratcheting cycle of the bail against the hooks under the container.

● **LOADING sequence. At top: Truck-mounted Dempster-Dinosaur backs up to loaded container. Center: Hydraulic cylinder pulls container onto tilting frame. Bottom: Frame is lowered and container pulled forward and locked.**

Plowing an AIRPORT or PARKING LOT, CITY STREET or EXPRESSWAY . . .

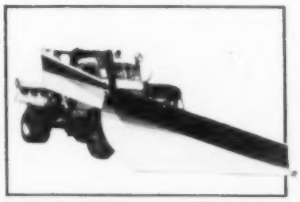
Think of

FRINK

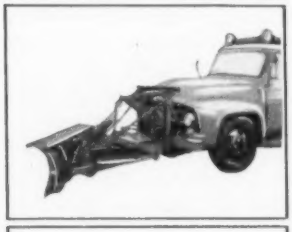
—The Plow Designed for the Power and Performance to Meet YOUR Snow Removal Needs

Whether snow removal problems in your area require a high-speed, heavy-duty V-type plow (**above**) or a lighter, maneuverable Reversible type, Frink has the plow specifically designed to do the job . . . faster, safer, at lower cost.

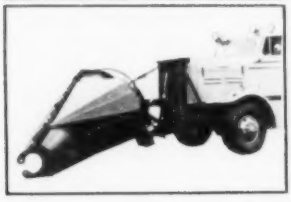
Frink, the pioneer in advanced snow-plow design for 35 years, makes four basic types of plow, each with models to fit 1½ to 12 ton trucks . . . and most are interchangeable on same truck attachment. Get full details from your Frink distributor or write Frink for descriptive folders about any of these plows —



ONE-WAY Snow-Plow with Trip Blade
Finest speed plow made . . . tapered, curved moldboard throws and spreads snow to minimize deep banks, yet windrows neatly at city speed.



REVERSIBLE PLOW with Trip Blade
The all-purpose plow . . . throws right or left, or bulldozes straight ahead . . . cab lever sets position automatically, even while plowing.



ROLL OVER Plow with Taper Blade
Made only by Frink . . . can rotate to left or right position in 15 seconds . . . high-speed for deep snow . . . ideal for airports and dual highways . . . ends deadheading . . . easier to park.

V-TYPE Sno-Plow (shown at top)
Rugged powerhouse for heavy-duty plowing . . . self-ballasting to keep nose down, prevent side thrust . . . bevels side banks . . . will not wedge . . . safe at high speed . . . economical in use.

For Snow Plow Know-How It Pays to Think of FRINK SNO-PLOWS

Clayton, 1000 Islands, N. Y.
Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

Get

NEW TOP

TRACTION . . .
MOBILITY . . .
CAPACITY . . .
with a

HENRY

TRACTOR FORK LIFT

No doubt about it . . . a newly-designed HENRY Tractor Fork Lift attached to big-tire Utility Tractors adds more power, traction, mobility . . . to materials handling jobs. Here's the Lift that's tops for economy too!

Built with a new sub-frame design for equalized weight distribution, the large tractor tires give more ground clearance and traction, and greater cushioned mobility regardless of ground conditions.

Choose one of the four models and 8 attachments for your operations now. See your nearby equipment dealer who sells the best . . . HENRY!

COAST-TO-COAST SALES & SERVICE

HENRY®
MANUFACTURING CO., INC.
TOPEKA, KANSAS

YOU CAN DO IT BETTER WITH A HENRY

Almost crippled by the heaviest snowfall of the season, this is how . . . .

QUICK ACTION SAVED WAUKEGAN

Last January a heavy, 2-day snowstorm of blizzard proportions hit Lake County, Illinois. The 12-inch snowfall blanketed the downtown area of the City of Waukegan and became a king-sized headache to local business and industry as 3 to 4-foot drifts stalled hundreds of cars on streets and paralyzed traffic completely.

While city crews worked with all available plowing equipment, quick action by Mayor Robert Sabonjian of Waukegan and his City Council arranged for a demonstration by Howell Tractor & Equipment Company of a snow removal unit that incorporated a Model HH "PAYLOADER" with a Ram Rotary Plow attachment. Before daylight the following morning, a fleet of city trucks plus several larger-capacity rented units were moving down Waukegan's main traffic routes alongside the blower and shuttling back and forth to the snow dumping area. By actual timing, the blower averaged less than 60 seconds to load out a 10 cubic yard truck.

Demonstration Does It

Members of the City Council watched as the operation moved through the business districts, clearing the way for normal traffic. Loading continued and progressed well enough so that rented haul units could be dismissed. On the second day of the amazing demonstration, the high production blower arrangement kept nine city trucks busy on the shuttle-haul cycle until the cleanup work was completed.

WAUKEGAN'S AGGRESSIVE MAYOR, Robert Sabonjian (right) and Street Superintendent George Teeling were instrumental in setting up specifications for additional snow handling equipment that helped "save the day".

Solely on the basis of this efficient snow removal demonstration at a crucial time, the Waukegan City Council approved the purchase of the "PAYLOADER" with the rotary snow plow attachment. According to Street Superintendent George Teeling, the digging-out process had put a tremendous load on his men and equipment until the snow blower stepped into the breach.

No End to Jobs it Now Handles

Interviewed six months later, Mr. Teeling reported that the "PAYLOADER"

BY ACTUAL TIMING — Heaped 10-yard trucks were loaded in less than 60 seconds. The rotary blower attachment cleaned up the windrows right down to the pavement without damage.

YEAR-'ROUND USEFULNESS — Since the big January storm, Waukegan's Street Department has found that the "PAYLOADER" equipped with a 1¾ yard bucket is even more helpful and worthwhile in everyday use.

certainly had demonstrated its worth on the city's snow clogged streets . . . however, since the big storm, his department had found the machine even more useful and worthwhile in everyday use, equipped with a 1¾-yd. bucket. "This is the first rubber-tired loader we've owned," he said. "We have better than 500 working hours on it now and it's never been laid up for a minute. Every day it helps us to do many jobs so much easier and faster that we'll never be without one."

Teeling cited some examples . . . "Just this morning we used it to load out stumps and logs on an access road being built into our new sanitary landfill project . . . one day we rigged a cable sling on the loader bucket and pulled out 170 concrete street markers, a job that would have taken a week to complete without the loader's help.

"On a moment's notice we run it into the storage yard to load barrels of tar or concrete sewer tile into a truck . . . and, we found it does a great job of tearing up old sidewalks. It's no trick to work the bucket lip under a slab so that the ground level pry-out force can break it up. The 5′ x 5′ blocks slide right into the bucket for quick and easy truck loading."

Mobility of a Truck

"I know this HH 'PAYLOADER' is ideal for communities the size of Waukegan (45,000 pop.)" said Teeling. "The machine is fast and easy handling. It moves through city streets as fast as any of our trucks and it has more and better traction on hard surfaces than our big crawler tractors. It doesn't break up roads and curbs working on them and, best of all, I never have to worry about trailing it. It takes itself to the job, gets the work done and is back again sooner than I used to be able to arrange for a truck and trailer to haul our crawler."

There's no limit to the utility value of this tractor-shovel any season of the year. With its interchangeable attachments, the multi-purpose "PAYLOADER" can serve as a back-hoe, pick-up sweeper, side boom crane, a scraper or a clamshell.

A MONEY-SAVING INVESTMENT

You can save manpower and manhours for your community by investigating the year-'round usefulness of any 4-wheel drive "PAYLOADER" tractor-shovel. Ask for a demonstration to prove it can be the most useful machine in your equipment pool! The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Illinois.

Modern Materials Handling Equipment
THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
9-B-2

IN A TIMELY DEMONSTRATION on Waukegan's snow clogged streets, the high production blower kept nine city trucks busy on the shuttle-haul cycle that cleared the way for normal traffic.

PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Continuous Sludge Centrifuging

In 1954, when a primary sewage treatment plant was authorized by the North San Mateo County Sanitation District, California, to serve a population of some 55,000 persons and to provide capacity for an average daily flow of 4 mgd, it became necessary to construct the plant on a site surrounded by a residential and shopping area adjacent to a city park. The treatment plant had to be completely housed which precluded the use of open sludge drying beds. Centrifuging the digested sludge offered an economical and nuisance-free method of dewatering the sludge. This is accomplished by an 18-inch x 28-inch Bird Continuous Centrifuge powered by a 15-hp electric motor. The total cost was approximately $11,000. The cake from the centrifuge is delivered to a dump truck by means of a belt conveyor. The entire volume of digested sludge from the present contributing population of 35,000 persons is handled by centrifuging facilities occupying a room 12 ft. x 18 ft. in size. Another peculiar set of trying circumstances at the City of San Leandro, California, sewage and industrial wastes treatment works provide an opportunity to demonstrate further the unique possibilities for the centrifuging of raw sludges. This installation has made it possible to handle up to 100,000 gpd of combined raw domestic sewage and industrial waste sludges, together with raw and partially digested scum and sludge from the inactive digesters.

"Continuous Centrifuging Used to Dewater Variety of Sludges." By John H. Jenks. *Wastes Engineering*, July, 1958.

Metropolitan Sewer Planning

Early in 1957, a Metropolitan Sewer Authority was established in Erie Co., New York, and a staff was provided toward the end of that year. Preparation of plans for sewer systems to serve four municipalities is in progress. Under the New York State Law, county agencies may be organized for the purpose of providing water, sewers or drainage facilities and may permit municipalities within a county to engage in cooperative large scale planning and construction if they choose to do so. The agency may also prepare master plans for sewers and treatment throughout the county for consideration by local municipalities. Planning agencies can assist the development of superior neighborhoods and construction of sewers in many ways. These include: 1) Zoning land to prohibit housing developments in areas with poor drainage or where the location is such that the provision of utilities is costly or impractical. 2) Permitting smaller lot sizes where water and sewer lines are available. 3) approving lateral sewers and temporary sewage treatment plants in areas where construction of trunk sewers ultimately to service the area is underway. It is therefore highly desirable that planning officials and sanitary engineers work closely together in the organization of utility services for suburban localities.

"Metropolitan Planning for Sewers On a County Basis." By C. C. Spencer. PUBLIC WORKS, August, 1958.

Sewage Aeration

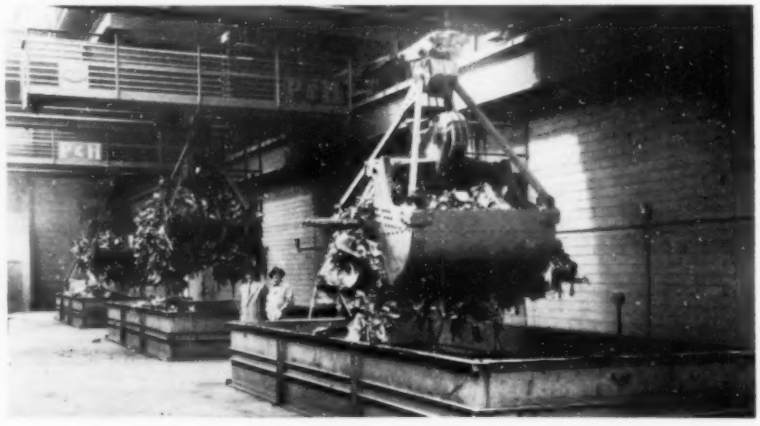
This extract from the Annual Report of the Manchester Corporation River Dept., England, presents some

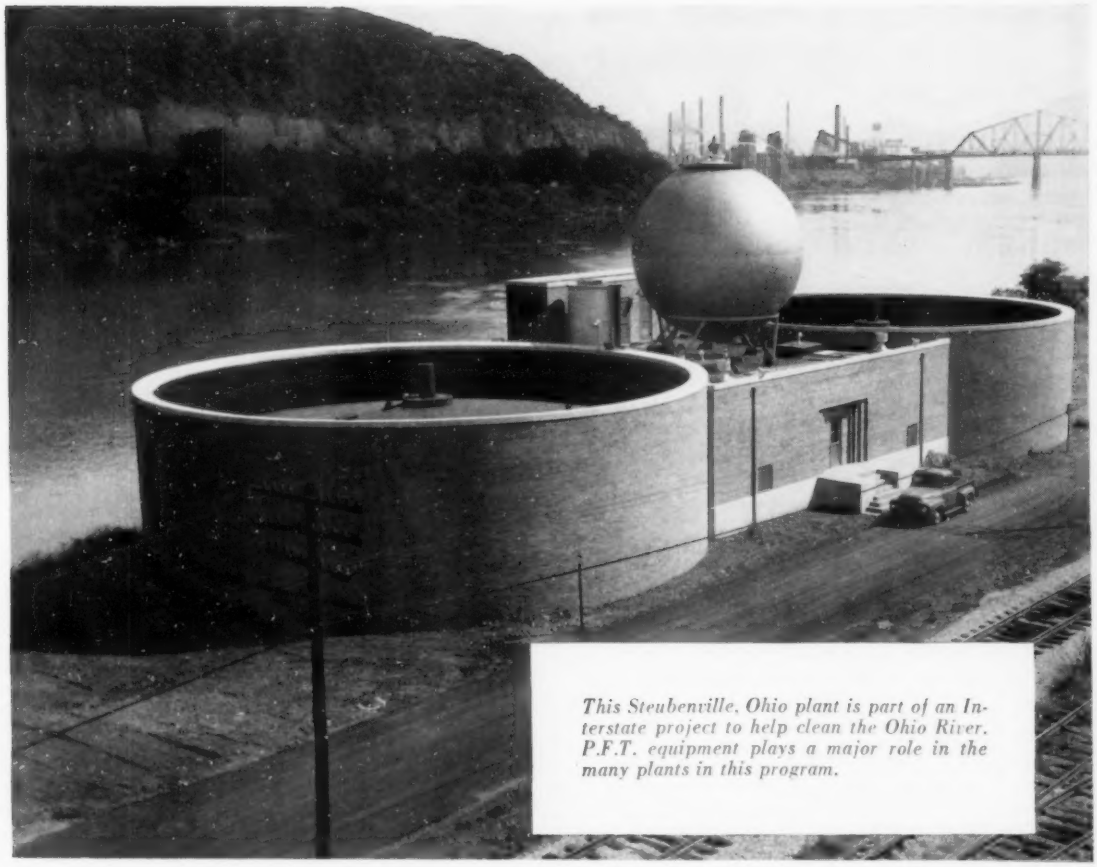
Grapples at Chicago Incinerator

THE MEDILL Avenue incinerator plant in Chicago, designed and built under the supervision of Paul Gerhardt, Jr., architect for the City of Chicago, has a rated capacity of 720 tons daily. Now two years old, it processed 168,755 tons of refuse in 1957.

To handle the refuse, the plant is equipped with two Blaw-Knox TI-300 grapples and a Size 7301 bucket. The grapples handle 90 percent of the refuse, while the bucket is used primarily for clean-up of the pit bottom. Peak load for a grapple is 2,680 lbs. with the average load per lift weighing 1,680 lbs. The grapples and bucket are operated from three P&H overhead cranes manufactured by Harnischfeger Company.

A fairly common design error, not made in the Medill Plant, is failure to allow sufficient headroom for buckets. As illustrated in the photograph, the units require considerably more headroom than would be indicated by their top-to-bottom measurement to prevent scraping off material hanging from sides and bottom as they pass over a hopper.





This Steubenville, Ohio plant is part of an Interstate project to help clean the Ohio River. P.F.T. equipment plays a major role in the many plants in this program.

P.F.T. Equipment helps make Steubenville important link in Ohio River clean-up

Eight states are co-operating in the huge Ohio River restoration program. This new Steubenville plant is already doing its part. Across the river, the new Weirton, West Virginia plant will soon be completed. Alden E. Stilson & Associates are the Consulting Engineers for both plants.

Notice that Steubenville's high pressure storage sphere is mounted on top of the digester control chamber. A P.F.T. Gravity Gas Holder provides control for the high pressure gas compressor assuring its efficient operation during periods when excess gas is available for storage.

The P.F.T. equipment in Steubenville includes: two 65' Floating Covers, two Liquidometer Liquid Level Gauges with low level alarms, two #500 Shell & Tube Sludge Heat Exchangers, two Removable Supernatant Selectors and Gas Safety Equipment.

If you would like further information on any of this P.F.T. equipment, please write.

waste treatment equipment exclusively since 1893

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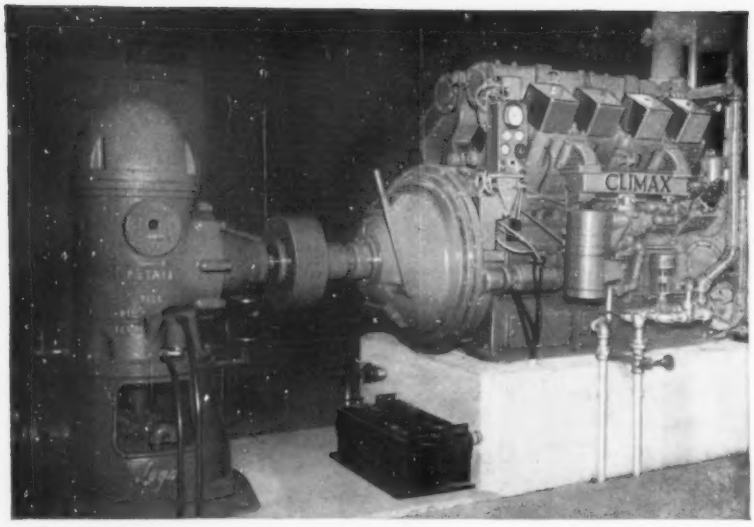

IMPORTANT FACTS ABOUT CLIMAX STANDBY ENGINES!!

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All models operate with equal efficiency on gas, butane or gasoline.

FAST, EASY STARTING—
Climax engines take over the complete load within seconds after normal utility power fails. If the starting system is manual, you merely press a button on the instrument panel...if automatic, the engine starts immediately.

SIMPLE TO OPERATE—
All instruments and controls are located at the sides of the engines . . . easy to read . . . easy to adjust.

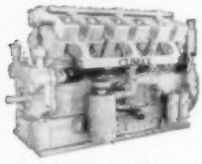
SIMPLE TO MAINTAIN—
Accessories are within "arm's reach" to allow quick inspection and adjustment. Crankcases and engine bases have large hand holes on each side for easy access to all working parts.

SAFETY PROTECTED—
Safety devices are standard equipment on all models and automatically protect the engines against high water temperature and low oil pressure. An overspeed governor can also be furnished, if required.

ACCESSORIES—
Various types of cooling and starting systems, mufflers, etc. are available to make each engine suitable for a particular application.

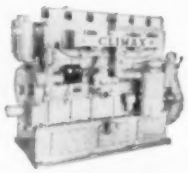
LONG ENGINE LIFE—
Climax engines are constructed of the finest metals, alloys and component parts available. Any model will give years of service if properly maintained.

Write today for complete information, bulletins or engineering consultation

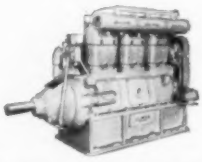


V-125—12 cylinder, 605 max. H.P. at 1200 R. P. M.
V-122—12 cylinder, 520 max. H.P. at 1200 R. P. M.

V-85—8 cylinder, 390 max. H.P. at 1200 R. P. M.
V-80—8 cylinder, 340 max. H.P. at 1200 R. P. M.



K-75—6 cylinder, 302 max. H.P. at 1200 R. P. M.
K-67—6 cylinder, 265 max. H.P. at 1200 R. P. M.



R-165—6 cylinder, 192 max. H.P. at 1200 R. P. M.

CLIMAX ENGINE MANUFACTURING CO.
DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY – CLINTON, IOWA

pertinent information and data on some large scale and small scale investigations now taking place at Davyhulme in connection with the various modifications of the activated sludge process. The report also gives some preliminary data connected with the operation and performance of the Pasveer modification of the activated sludge process recently developed in Europe. The Pasveer process depends on intense aeration and turbulence in a shallow tank by means of a rotating brush and a material reduction in detention time of the sewage in the aeration tank. This method requires a much higher power consumption per unit of sewage treated so the problem is reconciling extra power costs with the capital costs of more conventional processes of aeration. The Manchester plant on a short trial has produced interesting results indicating a removal of BOD per kw-hour of 2.15 lbs. in a detention period of 1.52 hours. The report also contains interim results of the operation of a small percolating filter used to investigate the efficiency of recirculation filtration. At loadings of between 0.24 and 0.28 lb. of BOD per cubic yard per day effluents were obtained with 40 to 69 ppm BOD, with no nitrate nitrogen being detected in the filter effluent. These results seem to verify previously known information that it is not easy to obtain effluents with BOD concentrations below 20 ppm if the loading to the filter is much above 0.23 lb. BOD per cubic yard per day.

"Sewage Aeration." By John Finch. *Water and Sewage Works*, July, 1958.

Special Connecting Structures

A special connecting structure in sewer work is one that has been subject to design analysis. In this article the discussion is confined to the situation where the natural fall of the ground along the desired sewer route is barely sufficient, or is insufficient, so that velocity somewhere in the system is not fully adequate. Saving head in manholes may be justified in either of two ways, depending upon circumstances: 1) The head which is saved may permit use of a smaller size pipe and a reduction in the total cost of construction may result; or 2) by utilization of the saved head, more feet of pipe may be built and thus a disposal point may be reached without construction of a pumping station. Several tables are provided to aid in the computa-

Curbing pollution of Biscayne Bay

LINK-BELT equipment mechanizes sludge collection and disposal at new sewage treatment plant

Miami's recent, rapid growth has multiplied the pollution problem throughout its bay area—crimping such activities as swimming, boating, water skiing and fishing. Miami has met this threat to its tourist economy with construction of a $27,000,000 sewage disposal project.

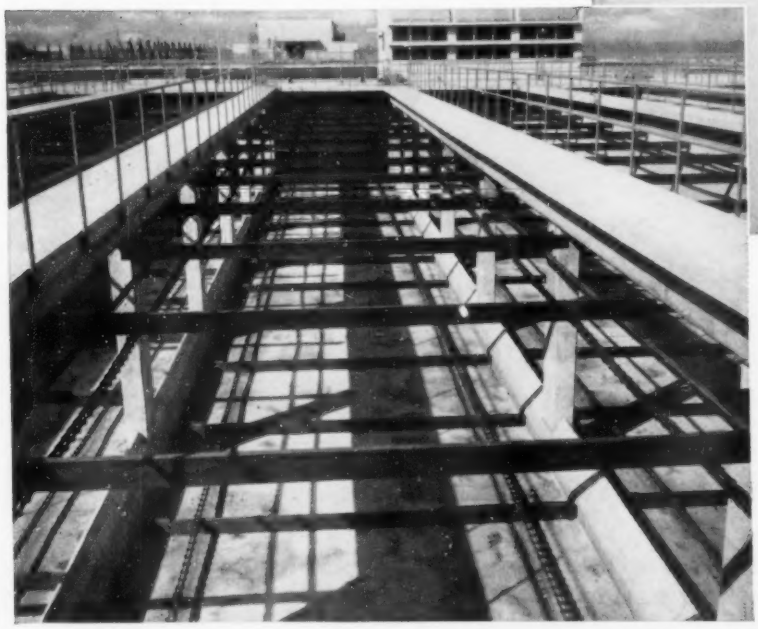
Inside and out, Miami's new activated sludge treatment plant utilizes sanitary engineering equipment by Link-Belt. A system of grit collectors with conveying screws and sludge collectors assists in low-cost treatment of sewage. Link-Belt bucket elevators carry liquid sludge to filters and belt conveyor . . . team up for efficient handling of the dewatered sludge. And Link-Belt Gearmotors and P.I.V. drives provide dependable power transmission for such equipment.

Link-Belt's complete line of equipment and broad engineering experience assure economical, effective water, sewage and waste treatment for municipalities and industries throughout the nation. A call to your nearest Link-Belt office will put you in touch with sanitary engineers who will work with your consultants and chemists.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

▲ **COMPLETE CONTROL PROJECT** provides interceptors, force mains and deep outfall line to deliver sewage to the Virginia Key activated sludge plant and to discharge plant effluent 4,600 feet out into the ocean. Design engineers were Rader Engineering Associates, Metcalf & Eddy and Maurice H. Connell and Associates, Inc.



◀ **BY THE DOZEN** — Here is just one of twelve Link-Belt Straightline sludge collectors operating in primary settling tanks at Miami's new plant. Sixteen Link-Belt Gearmotors drive sludge collectors and cross conveyors.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World. TI 914

See our exhibit—Federation of Sewage and Industrial Wastes Association, October 5-9, Detroit, Michigan.

tions in this article. For any community the economic justification of special manhole structures should be worked out using the proper costs for the component parts.

"Special Connecting Structures in Sewer Work." By R. J. Fletcher. PUBLIC WORKS, August, 1958.

Chromatographic Analysis of Gas

Another parameter which may be useful in studying the mechanism of sludge digestion is the use of gas chromatography for the qualitative and quantitative determination of the gases from anaerobic decomposition, namely, CH_4, CO_2, H_2S and NH_3. Two major techniques are used for the separation of gaseous components: 1) Partition chromatography (gas-liquid column), and 2) absorption chromatography (gas-solid columns). The separation is obtained during passage of the mixture through an adsorption column with each gas component having an "affinity" for the column material (activated charcoal, silica gel or alumina) for a definite time interval dependent upon the characteristics of that gas component, the column and other variables. A comparison is made between the thermal conductivity of the unknown gas and the carrier gas surrounding two separate electrically-heated filaments and measured by means of a Wheatstone Bridge. Several typical curves and tables in this article show analyses made by one of the new tools that may take its place alongside of other time-proven techniques and parameters which have been developed in the field of sanitary chemistry and engineering.

"Chromatographic Analysis of Gas." By W. N. Grune and R. C. Peek. *Wastes Engineering*, July, 1958.

Digester Supernatant

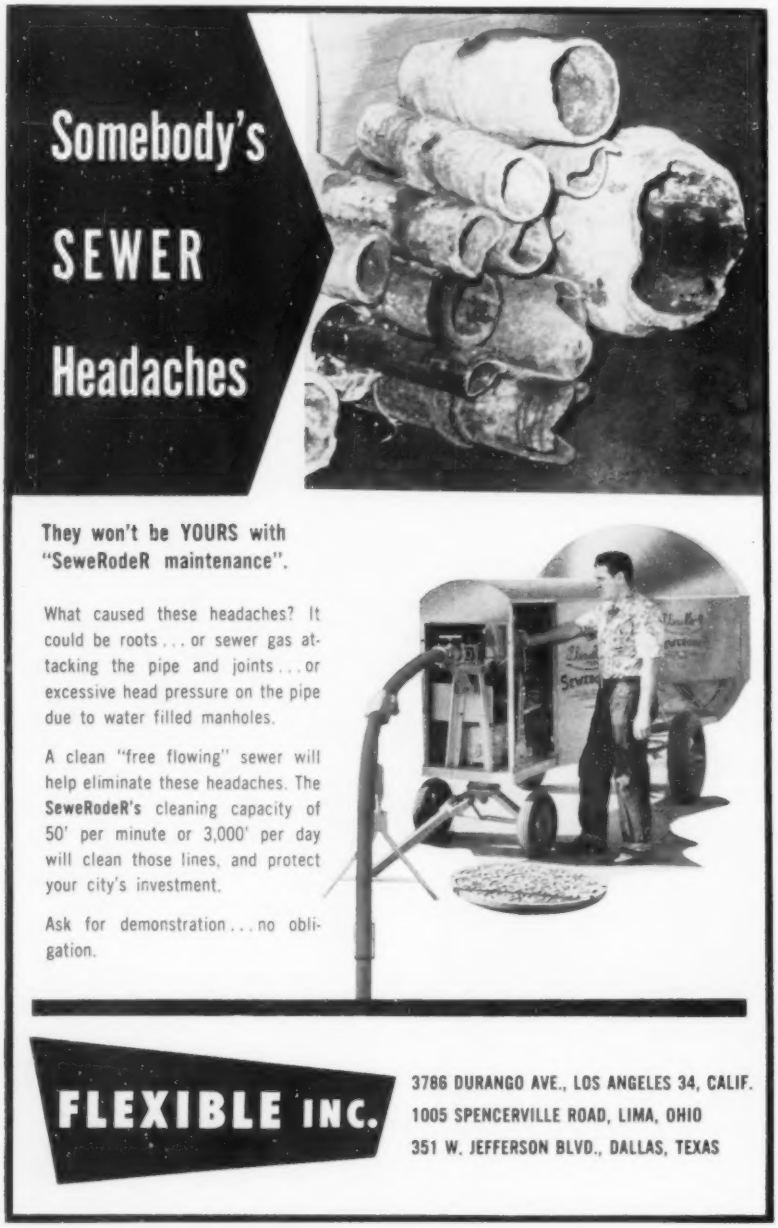
The production of a minimum volume of good digester supernatant liquor with a low solids content is of prime importance for successful and proper digestion and reduction and elimination of supernatant disposal problems. The author concludes 1) that sludge concentration tanks of proper design and with proper and adequate decanting facilities should be required for each sewage plant; 2) untreated digester supernatant should be discharged to the plant at as low a rate as possible throughout the day and night; 3) digester supernatant should be given adequate and proper pretreatment before it is discharged to the sewage plant; 4) phenols and phenol derivatives seem to be the main destructive force in digester supernatant that causes plant upsets; 5) elimination of the destructive force of phenols is possible a) by aeration, preferably with compressed air; b) by oxidizing and reducing agents; and c) by bacterial activity; 6) if untreated digester supernatant is discharged to the plant, the treatment units should be designed to take care of this loading.

"Digester Supernatant: Problems, Characteristics, and Treatment." By Stanley E. Kappe. *FS&IWA*, July.

Other Articles

"Algae and Their Effects on DO and BOD." Part II. This detailed presentation of this article is being published in hope that the report on this study will stimulate other investigators to undertake work along these lines and extend our knowledge of this problem. By Theodore F. Wisniewski. Water and Sewage Works, July, 1958.

"A Review of the Literature of 1957 on **Sewage, Waste Treatment and Water Pollution.**" This last of three sections of the review covers water pollution. By Committee on Research. Federation of Sewage and Industrial Wastes Asso-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They won't be YOURS with "SeweRodeR maintenance".
What caused these headaches? It could be roots . . . or sewer gas attacking the pipe and joints . . . or excessive head pressure on the pipe due to water filled manholes.
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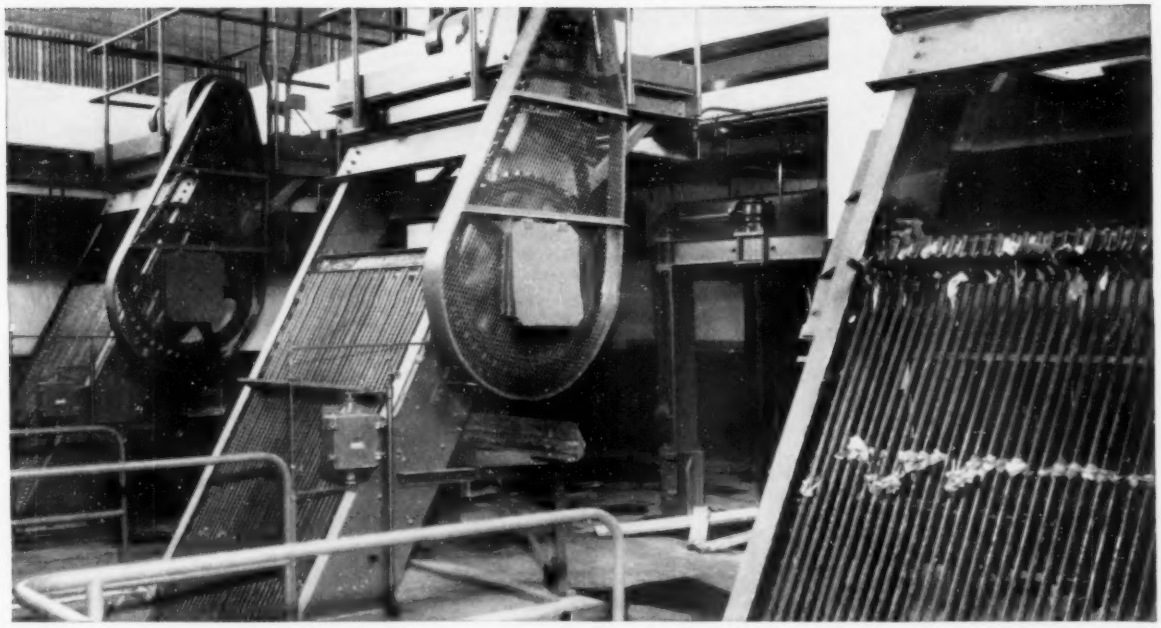
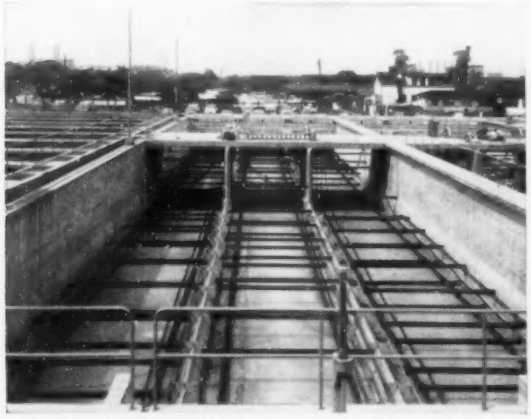


No jamming at bottom of screens *with mechanically back-cleaned Jeffrey Bar Screens. Rake lifts off accumulated screenings as the flow enters bars.*

Again... Bowery Bay Plant chooses Jeffrey sewage treatment equipment

Confidence in the efficiency and reliability of Jeffrey sewage treatment equipment resulted in its use in the original 40 mgd Bowery Bay Plant... when the World's Fair triggered New York City's long range attack on harbor pollution. Selection of Jeffrey Bar Screens and Collectors for the recent big extension of plant capacity (now 120 mgd) testifies to the performance record of the 18-year-old Jeffrey equipment.



Jeffrey Collectors *were specified for 6 primary settling tanks and 8 final tanks added at Bowery Bay. Under ordinary conditions, mechanical disturbance can be limited to less than 1 hour in 24, due to large carrying capacity.*

Jeffrey Bar Screens—Nine of these mechanically back-cleaned bar screens have been added to facilities at Bowery Bay. Rakes enter from discharge side and project through bars as they travel from bottom toward headshaft. Screenings are carried over the top and drop off as rakes leave the screen bars.

If screenings accumulate rake lifts them off as it enters the bars. This action virtually eliminates jamming at the bottom of the screen.

Primary and Final Settling Tanks—Rectangular tanks, equipped with Jeffrey Collectors, have proved to be the most efficient sedimentation device ever designed. Stable conditions of flow make possible maximum solids removal in tanks of minimum size. Simplicity and ruggedness of Jeffrey Collectors assure long life and trouble free operation.

Large carrying capacity of Jeffrey Collectors permits intermittent operation... significant power savings, a thicker sludge and clearer effluent.

Once you review the facts on the design efficiency and quality of Jeffrey equipment for water, sewage and industrial waste treatment, you'll see why so many important projects specify Jeffrey. Send for Catalog 905, The Jeffrey Manufacturing Company, 947 North Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

ciations, H. Heukelekian, Chairman. FS&IWA., July, 1958.

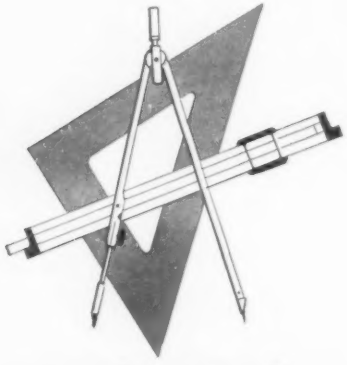
"The Biochemistry of Nitrogen in the Synthesis of **Activated Sludge.**" Report of a study on the effect of various methods of nitrogen in the synthesis of activated sludge." By J. M. Symons and R. E. McKinney. FS&IWA., July, 1958.

"Significance of **Minerals in Waste-Water.**" A report of an investigation of waste-water existing at various sewage systems throughout the U.S. By R. Stone and J. C. Merrell, Jr. FS&IWA., July, 1958.

'Operating A Nuisance-Free Plant." Part 7 of a supplementary series on getting the best performance from a sewage works. By Leroy W. VanKleek. Wastes Engineering, July, 1958.

"Sewage Treatment with **Trickling Filters.**" This article is a chapter of the forthcoming revision of the Trickling Filter Handbook. Public Works, August, 1958.

"Anaerobic Digestion." In respect to fundamental research studies on anaerobic digestion, there is much to be done. This article deals with the subject **from the standpoint of the bacteria,** rather than from that of the engineer or chemist; as such it presents an interesting concept of anaerobic digestion. By R. Rupert Kountz and John B. Nesbitt. Water and Sewage Works, June, 1958.



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The wide use of mechanical joint valves, hydrants, pipe and fittings has proved that this type of construction is good engineering. The joint is bottle-tight and permits deflection, expansion or contraction in a pipe line, without breakage or leakage. Other advantages include rapid and easy joint assembly.

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ESTIMATING CONSTRUCTION COSTS

A clearly written, practical volume for construction engineers, civil engineers and contractors, this book tells in detail how to estimate construction costs of all kinds and describes the various methods of preparing such estimates. Material, labor, equipment, overhead and profit costs are broken down. Then, with many examples, the author explains how to arrive at costs of materials, equipment and labor for a great variety of projects: earthwork, foundations, highways, concrete and timber and steel structures. Costs of many types of construction equipment are given, as well as the hourly cost of owning and operating such equipment. The author is R. L. Peurifoy, Professor of Engineering, Agricultural and Mechanical College of Texas. Copies are $10.75 each and are available from McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y.

COMPOSITE DESIGN OF STEEL BEAM AND CONCRETE BRIDGE DECKS

The two papers in this bulletin were presented at the 36th Annual Meeting of the Highway Research Board. The first, by I. M. Viest, R. S. Fountain, and C. P. Siess, outlines the background and development of the new "AASHO Specifications for Composite Steel and Concrete Bridges." The second, by Bruno Thurlimann, describes testing of a composite beam structure using different tvpes of shear connectors. On the basis of the results tentative design recommendations are made regarding use of steel shear connectors. Copies are available from the Highway Research Board, 2101 Constitution, Washington, D. C., at 80¢ each.

RUBBER WATER STOP APPLICATIONS

For those who wish to know in detail the function of rubber water stops in concrete construction, this 43-page publication will prove to be a valuable manual. Beginning with background information, the

AMERICA'S *FIRST* COMPLETE SERVICE TO THE SEWAGE TREATMENT INDUSTRY— *Smith & Loveless* FACTORY-BUILT LIFT STATIONS AND SEWAGE TREATMENT PLANTS

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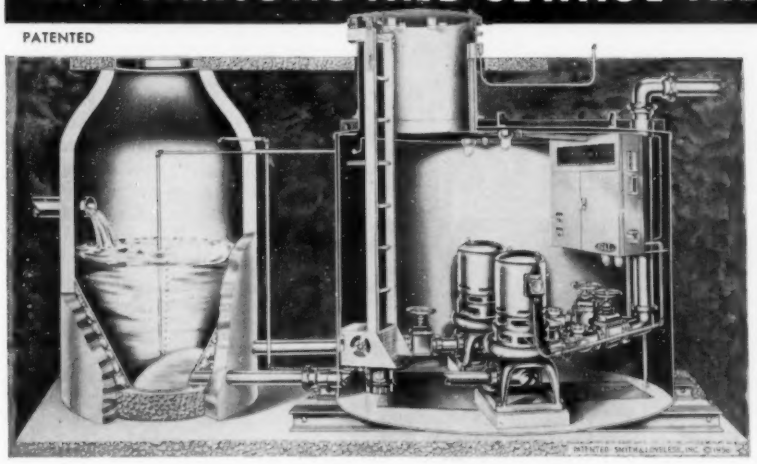

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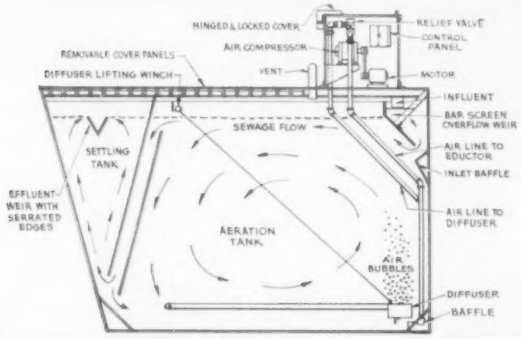
Precision assembled, central electrical control cabinet prewired and color coded, dehumidified interior to prevent condensation. Pumps have pressurized mechanical seals. Low in initial cost and easy to install. Smith & Loveless stations are designed to provide maximum efficiency and long life with a minimum of maintenance.

Smith & Loveless offer a complete line of standard size factory-built lift stations with capacities up to 4500 G.P.M.



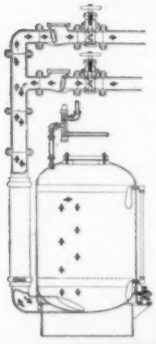
Smith & Loveless "OXIGEST" SEWAGE TREATMENT PLANT

A high-quality, low-cost sewage treatment plant for sub-divisions, schools, motels and industrial plants. The "Oxigest" plant has been carefully engineered for dependable treatment without requiring the services of a skilled operator. Approved by F.H.A. and State Health Departments where submitted.

Built of the finest materials and properly reinforced to withstand interior and exterior pressures. The Smith & Loveless "Oxigest" will provide a permanent plant with minimum annual maintenance. Smith & Loveless also provide a complete line of "Sy-No-Seal" rotary distributors and other sewage treatment equipment.

Write for Smith & Loveless "Oxigest" data manual with design notes, specifications, drawings, etc.

Smith & Loveless "WAY-O-MATIC"

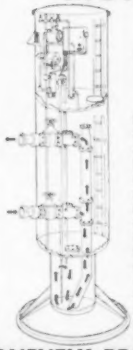


FACTORY-BUILT

SEWAGE EJECTOR

Ideal for installations requiring 200 G.P.M. or less. The "Way-O-Matic" Ejector practically eliminates maintenance as the sewage does not come into contact with any of the controls. Built of finest materials to provide maximum performance at factory-built prices. The "Way-o-matic" may be ordered as a separate unit or in a complete lift station. Cutaway drawing shows operating principle.

Smith & Loveless "MON-O-JECT"

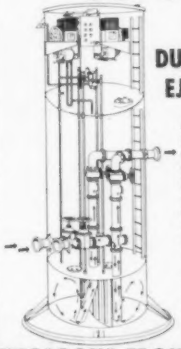


FACTORY-BUILT

SINGLE PNEUMATIC EJECTOR STATION

Designed for small installations of 200 G.P.M. or less. Completely automatic, extra large air storage. Requires minimum maintenance. Built of the finest materials and meeting the same high standards set by all Smith & Loveless lift stations. The "Mon-O-Ject" provides high-quality equipment for the modest budget. Requires minimum space underground. Cutaway drawing shows construction details.

Smith & Loveless "DU-O-JECT"



FACTORY-BUILT

DUPLEX PNEUMATIC EJECTOR STATION

Most small sewage lift projects are served most economically and dependably by the Smith & Loveless "Mon-o-ject" single pneumatic sewage ejector lift stations. Where duplex equipment must be provided, the Smith & Loveless "Du - O - Ject" meets the requirements most economically. Cutaway drawing shows construction details.

ALL S&L PRODUCTS ARE PERMANENTLY PROTECTED WITH S&L "VERSAPOX" EPOXY COATINGS

MAKERS OF WATER AND SEWAGE TREATMENT EQUIPMENT

S&L *Smith & Loveless, Inc.*

P. O. BOX 8884 KANSAS CITY 15, MO.

PLANT: LENEXA, KANSAS

REPRESENTATIVES IN PRINCIPAL CITIES

For job recommendations, complete specifications, dimension drawings, capacity charts, etc., all part of the latest Smith & Loveless lift station data manual.

WRITE DEPT. 40

No obligation.

book defines the types of joints according to anticipated movement and orientation. The placing of the stops to permit movement of each type of joint is discussed and illustrated with line drawings. Exact dimensions and shapes of 2 and 3 bulb stops of various sizes are given.

Engineering data on the shear stress-strain characteristics of rubber bearing pads are presented graphically. Drawings and photos likewise illustrate a section on installation instructions. The Gates Rubber Co., Product Application Division, Technical Dept., Denver, Colo.

PRESTRESSED CONCRETE PAVEMENT RESEARCH

This bulletin contains 3 papers presented at the HRB 36th Annual Meeting as follows: "Review of French and British Procedures in the Design of Prestressed Pavements," by Phillip Melville, deals with current design practices in those countries; "Theoretical and Practical Aspects of Prestressed Concrete for Highway Pavements," by Thomas Cholnoky, describes the design and testing of experimental prestressed concrete slabs at the Patuxent River Naval Air Station; and "Model Studies of Prestressed Rigid Pavements for Airfields," by Paul F. Carlton and Ruth M. Behrmann, describes studies carried on as part of the Rigid Pavement Investigation Program conducted by the Ohio River Div. Laboratories. Copies are $1.20 each and are available from Highway Research Board, 2101 Constitution, Washington, D.C.

COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE

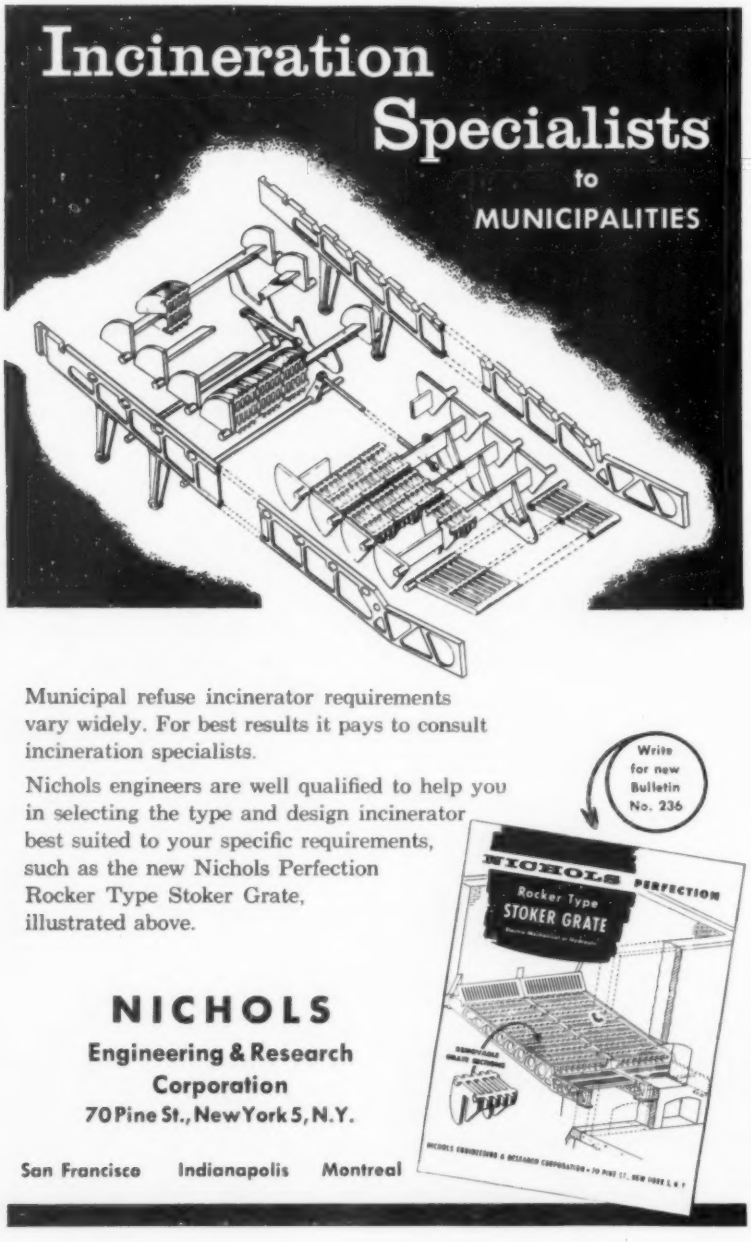
This is an engineering manual on the design of steel beams and concrete slabs for composite construction, showing advantages of the method and fully covering design procedures and practical applications. The well-rounded treatment gives the basis of composite construction and its advantages, develops design equations and procedures, describes methods of connecting slabs to beams, and includes illustrative examples of design procedure and design charts and tables. The methods and examples follow provisions of the 1957 specifications for composite design for highway bridges. The authors are Ivan M. Viest, R. S. Fountain and R. C. Singleton. Copies are $7.50 each and are available from McGraw-Hill Book Co., 330 West 42, New York.

CONCRETE TECHNOLOGY

This is volume I of two volumes on concrete technology written by D. F. Orchard, Prof. of Highway Engineering, University of Technology, Sydney, Australia. This volume deals with the properties of concrete and its constituent materials. The useful essentials of the latest information from numerous reliable sources are presented in a lucid and logical manner, so that the reader can find in one place just the information he needs. Some of the chapters covered are the kinds of cement and their properties, additives, concrete aggregates, lightweight concrete, concrete mix design and quality control, the properties of cements and concrete and deterioration of concrete and its resistance to chemical attack. Publishers are Contractor's Record Limited, Lennox House, Norfolk St., Strand, London, and the price per copy is 45s.

ORIGIN AND DISTRIBUTION OF UNITED STATES SOILS

A fine color map of the United States showing the soil texture and bedrock relationship of soils in the United States is now available. Copies of the map (size 30″ x 50″) may be obtained at $2 per copy from D. J. Belcher & Associates, 130 Forest Home Drive, Ithaca, N. Y.



Municipal refuse incinerator requirements vary widely. For best results it pays to consult incineration specialists.

Nichols engineers are well qualified to help you in selecting the type and design incinerator best suited to your specific requirements, such as the new Nichols Perfection Rocker Type Stoker Grate, illustrated above.

NICHOLS
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70 Pine St., New York 5, N.Y.

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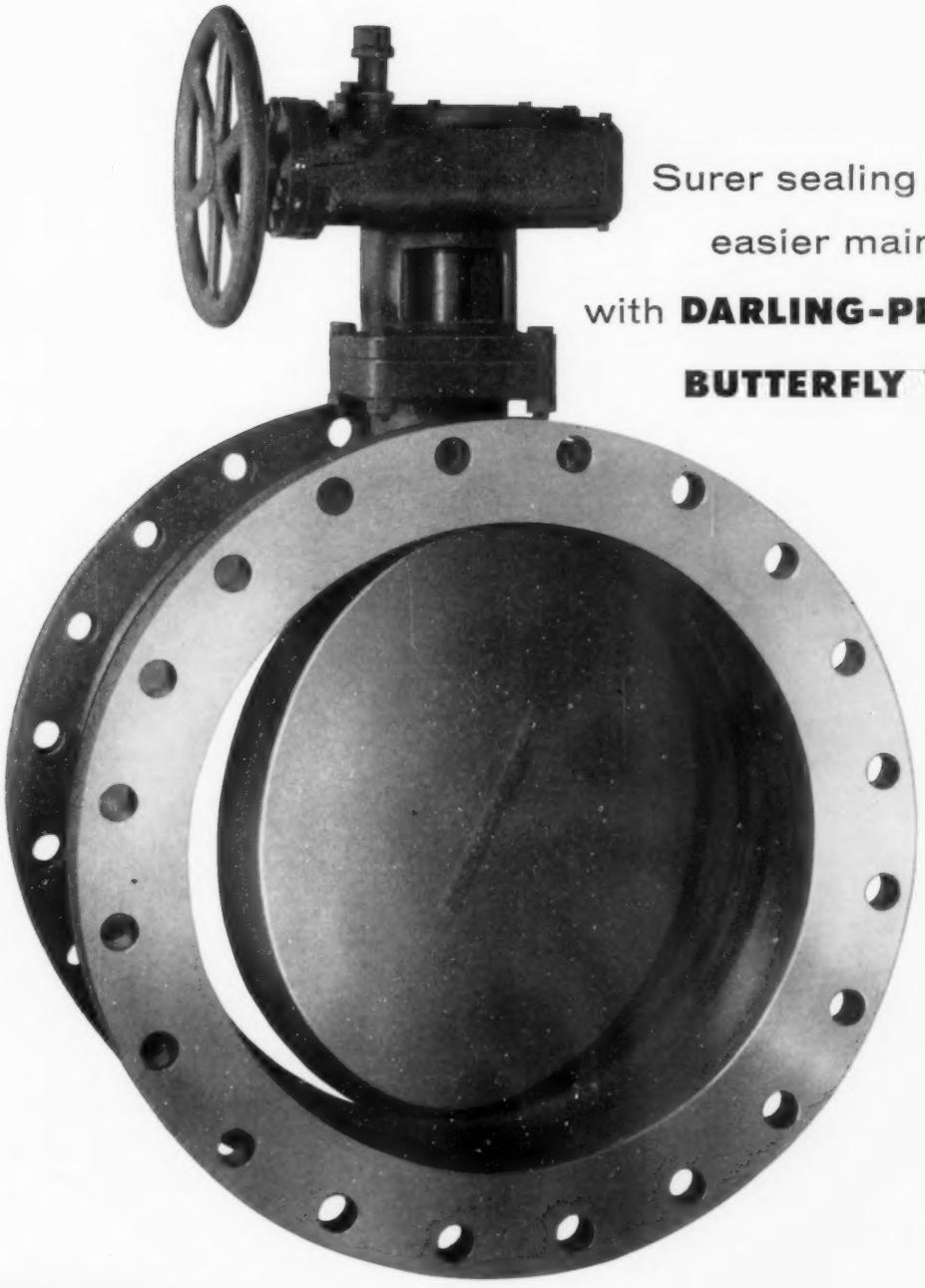

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easier maintenance
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DARLING VALVES

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DARLING-PELTON butterfly valves are new in both principle and performance. They offer you new advantages!

For example, a continuous and adjustable rubber seating ring provides full 360° sealing. The disc itself swings on an axis eccentric to the centerline of the valve.

This principle not only makes surer, drop-tight shutoff possible, but also eliminates shaft sealing problems, permits easy rubber seat replacement or adjustment without removing shaft or operator, and requires less operating torque.

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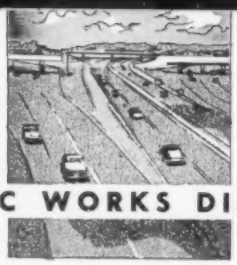


PUBLIC WORKS DIGESTS

Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Heavy-Duty Asphalt Pavement

Heavy-duty asphalt pavement constructed during below freezing winter months enabled the City of Chicago to open the Calumet Skyway Toll Bridge in record time. The fill sections had a cross section of 5 ins. of bituminous concrete over 20 ins. of crushed stone base. The binder was laid in two 1½-in. lifts; the surface course in one 2-in. lift. All of this was on 18 ft. of sand and/or slag fill, which placed the grade 20 ft. above existing city streets. The bridge sections called for 2 ins. of asphalt, 1-in. thickness of binder and 1-in. of surface course. To insure continuous operation and to eliminate cold longitudinal joints on the bridge sections, three 12-ft. finishing machines paved simultaneously. Initial rolling was done with a three-wheel, 10-ton roller. A self-propelled 10-ton pneumatic-tired roller was employed for further consolidation. Surface imperfections were ironed out with a heavy duty 3-axle tandem, 13-20-ton roller utilizing the transfer of weight theory. Surface tests were taken by straight edging. Allowable tolerance was ⅛ in. per 10 ft. A bumpmeter was used to check the mat and this was done immediately after the initial rolling so that, if necessary, corrections could still be made by hand or with rollers. Priming was applied at the rate of 0.4 gal. psy of MC-O on the flexible base and 0.1 gal. psy of RC-O on the bridge decks with a distributor. To prevent high winds from blowing the prime away, the entire spray bar was covered with canvas.

"Heavy-Duty Asphalt Pavement For Chicago's Calumet Skyway." By Armen G. Avedisian, Vice President, The American Asphalt Paving Co., Chicago, Ill. *Roads and Streets*, July, 1958.

Predicting the Amount of Cement Needed to Stabilize Soils

The relation between the cement requirements of soil-cement mixtures and surface area determined by the glycerol retention method was investigated for a group of plastic soils. For soils containing less than 45 percent silt, a strong correlation was found between surface area and the cement content at which a 10-percent loss occurred during 12 cycles of the freeze-thaw durability test. A regression equation and procedures were developed for predicting the cement requirement from the surface area. In a comparison of predicted cement requirements with those derived from freeze-thaw test data, an average deviation of 0.6 percent cement was obtained.

" A Rapid Method Utilizing Surface Measurements in Predicting the Amount of Cement Needed to Stabilize Plastic Soils." By Sidney Diamond and Earl B. Kinter, Highway Physical Research Engineers, Bureau of Public Roads. *Public Roads*, August, 1958.

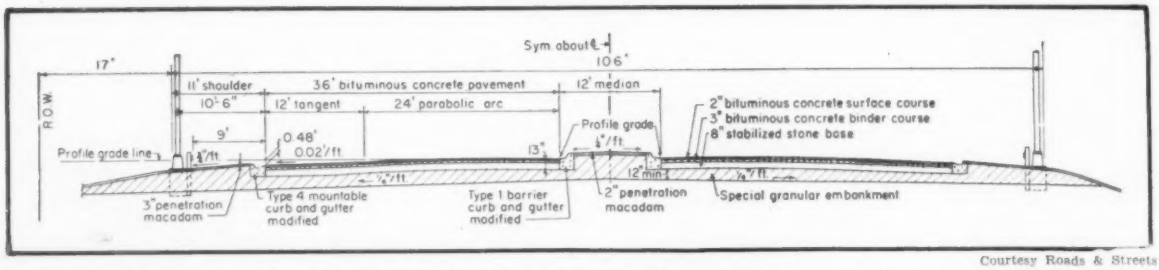
Important Role of Public Relations

To take care of the many requests about the State of Nevada, the Nevada Dept. of Highways for more than 20 years has published the *Nevada Highways* and *Parks*, a 32-page, full-color magazine, which is published 2 or 3 times a year with a run of 50,000 copies. The magazine is distributed free of charge and serves as an educational and reference work and advertises the state's scenic attractions to potential tourists. The magazine is printed by the state printing office and the production per issue, including research, editorial work, manufacture of engravings and press time would run about 6 months. More than 350,000 copies of an illustrated tourist map are printed each year, along with 100,000 copies of a second tourist map that shows the state's mountains and other geographic features in relief. The public-relations department staff consists of two people, the public relations officer and an assistant. The highway department has a staff photographer who takes the photographs. In a 6-month period the department sent out 25,000 pieces of literature in reply to approximately 6,000 letters received.

"Important Role of Public Relations in Nevada." By Donald L. Bowers, Public Information Officer, Nevada Dept. of Highways. *Better Roads*, July, 1958.

Winter Maintenance on Maryland Highways.

Maryland state roads comprise approximately 4,700 miles and during the 1957-58 winter 1,600 miles of the heavier traveled roads were under the bare maintenance program. Rock salt bought by the bulk and shipped by rail was stored in four 160-cu. yd. steel storage bins with undertrack screw and elevating conveyor,



Courtesy Roads & Streets

• **CROSS-SECTION of the Calumet Skyway, a project of the City of Chicago, showing heavy-duty asphalt pavement details.**

Gus Piepenstock, recently retired Assistant Street Superintendent of Redding, is proud of the Cat No. 12 shown leveling area for warehouse site. And he should know — he has worked with No. 12s since they were first introduced by Caterpillar 20 years ago!

"Our new No. 12 is an unbeatable piece of equipment"

That's how Gus Piepenstock, recently honored Assistant Street Superintendent for the city of Redding, Calif., feels about Caterpillar Motor Graders. And he should know. Cited for "21 years of outstanding service to the community," he built many of the streets of Redding with one of the first Motor Graders to come off the Caterpillar Tractor Co. assembly line. Redding has a new No. 12 now, and it's 100% improved.

The city traded the 20-year-old Cat No. 12 on its present machine. And in all that time, the trade-in machine had only *one complete overhaul.* Said Mr. Piepenstock: "There was no end to the good service we got from the old No. 12—used it 5 to 6 days a week. And we didn't have a bulldozer to help out then, and had to use our Cat Motor Grader to do everything."

The city of Redding likes its present rugged No. 12 even better than the veteran machine it displaced. (And even though the two machines look somewhat alike in outward appearance, mechanical advances have been such that only a handful of parts on the new No. 12 are the same as those on the '38 model.) Recently retired Gus Piepenstock says, "Ease of operation and ruggedness make Cat No. 12 Motor Graders unbeatable pieces of equipment. The sliding moldboard saves the city's money by reducing hand work in cleaning ditches and around telephone poles. And another king-sized feature is the electric starting—plus the fact our operator can work all day sitting down and not be all in at quitting time!"

Caterpillar Motor Graders have many *exclusive* features such as tubeless tires which reduce tire down time by as much as 80%, and the famous Caterpillar oil clutch that practically eliminates adjustment. The constant mesh transmission guarantees fast, easy shifting, and the Cat Engine, with its power output balanced to the machine for economical operation, can idle and pick up full load without fouling.

For *low final cost,* call your nearby Caterpillar Dealer. Get an on-the-job demonstration today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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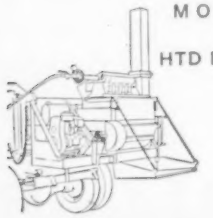
BEST MOTOR GRADER BUY FOR 20 YEARS

McConnaughay
HTD MIXER No. 10
½ TON PER BATCH

No Other Asphalt Mixers Can Do All These Things So Effectively

You can use a McConnaughay Mixer to reactivate and heat stock pile mixtures... prepare cold asphaltic mixtures... prepare hot asphaltic mixtures... dry various types of wet aggregates quickly, thoroughly... remove *both* moisture and solvents from bituminous mixtures... produce bituminous mixtures with tars, paving asphalts, cut-back asphalts, and emulsified asphalts. McConnaughay Mixers, operating under U. S. Patent No. 2,626,875, are authorized to mix emulsified asphalt and aggregates in the presence of flame and heated gases. Write for details and specifications.

MODELS TO MEET ALL REQUIREMENTS



McCONNAUGHAY MIXERS, INC.—LAFAYETTE, IND.

National distributors: Asphalt Equipment Co.
3314 Cherry Lane, Fort Wayne, Indiana

located strategically, at rail points, along the heavier traveled highways. Each of the approximate 400 truck units was equipped with a spreader in addition to a snow plow, and also, three "Sno-Go" units were utilized. An advanced warning system, direct teletype communication between the U. S. Weather Bureau and the headquarters office was used for weather forecasts. Maintenance crews erected 2,200,000 ft. of the standard type picket snow fence. Also, the Department is engaged in locating sites for the planting of evergreens to function as a live snow fence. Lack of two-way radio hampered snow and ice control operations, but a radio network is a must for this coming winter. Salt is spread at a four to six-foot width on the crown of the road and normally 600 lbs. of salt per mile per 24-ft. pavement will suffice for snows of from one to two inches.

"Winter Maintenance on Maryland Highways." By Frank P. Scrivener, Maintenance Engineer, Maryland State Roads Commission. PUBLIC WORKS, August, 1958.

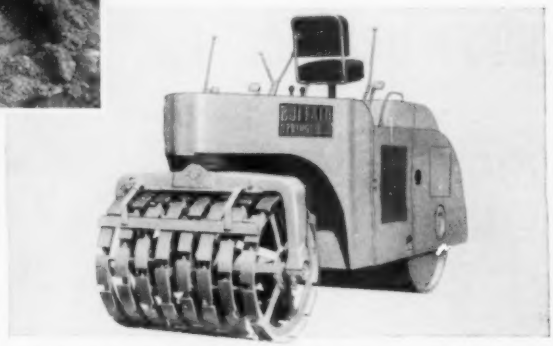
Getting Ready For Winter Weather

The United States Weather Bureau performs a priceless service in forecasting storms and blizzards in Chelan County, Washington. The county is responsible for the administration of 581 miles of roads. Total snowfall will vary from 250 ins. on the mountain passes to 36 ins. at the Columbia River. All major repairs to the equipment are made at the central garage. There are maintenance crews located in 4 other towns, besides a crew at the central garage. Crews vary in number from 2 to 12, depending upon the miles of roads they are responsible for. The snow removal fleet consists of 23 trucks, 6 motor graders, 4 tractors and snow blades and one SnoGo. The fleet of trucks is usually sufficient to remove snow up to depths of 10 ins. Deeper snows and widening operations require the services of the motor graders with their larger plows and wings. Slides and drifts must be removed by the SnoGo and dozers. Radiotelephone is essential and the system consists of one 60-watt base station with a remote control unit located at the central shop and at the Engineer's office. There are 10 mobile units of 60-watts each installed in various county equipment for effective snow and ice control operation and for the other maintenance and construction operations in the county.

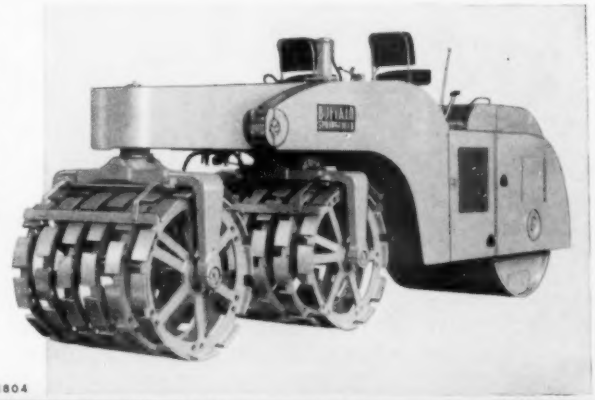
"Getting Ready For Winter

How to get 3 to 7% GREATER COMPACTION DENSITY

With SEGMENTED ROLL you get greater and more uniform densities on earth fills, stabilized base materials, hot and cold-mix bituminous surfaces . . . in fewer passes!



NOW available in 2 sizes for all Buffalo-Springfield® 2-axle and 3-axle tandems . . . any model (from 5-ton metal weight, and up).



Quickly interchangeable . . . readily added to B-S-R rollers now working in the field.

Combining the best compaction benefits of both the projecting lug-type roller, and smooth-faced roll, Buffalo-Springfield 2 and 3-axle tandems offer you a unique method for faster, better compaction on a wide range of materials. Optional segmented roll, mounted in guide-roll position, applies pressure in a flat foot-print pattern . . . and is followed by smooth drive-roll pressure, *all in a single pass.* Result: job-performance tests show 3 to 7% greater compaction densities, as compared with conventional rolling methods.

Segmented roll is faced with staggered rows of heavy steel pads, which operate on an *"interrupted pressure"* principle of compaction. The pads individually enter loose materials with a minimum of displacement sideways or forward . . . then leave the material without disturbing compacted areas. All compaction effort is exerted in a *downward direction.* Segmented roll is, of course, readily interchanged, as your work requires. This is a real time-and-money-saving opportunity worth looking into! Better call your Buffalo-Springfield distributor about this right away.

B804

BUFFALO-SPRINGFIELD ROLLER CO.

SPRINGFIELD, OHIO • DIVISION OF KOEHRING COMPANY

VERSATILE ACKER EARTH AUGERS

aid highway program before and after construction

The Acker AP Earth Auger is the highway construction man's most versatile friend.

BEFORE CONSTRUCTION, it "doubles-in-brass" with dependable, accurate soil sampling of sub-surface conditions. This it accomplishes with large diameter or continuous flight augers. For deeper sampling, the Acker Earth Auger speedily converts into a core drill for *inexpensive shot core* or diamond core drilling.

AFTER CONSTRUCTION, it speedily digs holes for setting guard rails, highway signs, light poles, etc. Or, used as a shot core drill the Acker Earth Auger will obtain clean, unbroken highway test cores.

So, whether or not it's used *before* or *after* construction it will pay you to investigate the versatility of the Acker AP Earth Auger.

Please write for Bulletin 40PW.

See Acker Versatility in your own office—write us about our 16mm sound motion picture in full color which will be loaned free of charge to interested parties.

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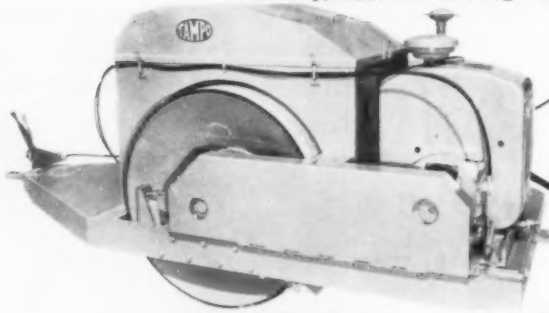
Over 40 years of experience manufacturing a complete line of diamond and shot core drills, accessories and equipment.

HIGH VOLUME VIBRATORY COMPACTION

MORE WORK WITH HALF THE WEIGHT!



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TOW TYPE
True vibratory compaction at maximum depth. Write for literature.

- COMPACTING POWER . . . . . 30 to 40 tons
- CENTRIFUGAL FORCE . . . . . 13,200 lbs. Max.
- GROSS WEIGHT . . . . . 7,000 lbs.
- VIBRATING FREQUENCY . . . . to 1,900 VPM
- VIBRATION FREQUENCY IS VARIABLE BY ENGINE THROTTLE SETTING REMOTELY CONTROLLED BY OPERATOR

TAMPO MANUFACTURING COMPANY
PErshing 3-9171 • 1146 W. Laurel St. • San Antonio

Weather." By Donald B. West, Chelan County Engineer, Wenatchee, Wash. PUBLIC WORKS, August, 1958.

Turnpikes Are Expected to Be Snow-Free

Maintenance forces along the 236-mile Kansas Turnpike battled 24 snows and several additional ice and sleet storms during the 1957-58 winter season. The maintenance crews are organized into 8 sections, each responsible for approximately 30 miles of roadway with division headquarters at Wichita supervising 4 southern sections and another division office at Topeka handling the 4 northern sections. Each section has a foreman and 3 men, all machine operators, on regular daytime duty. Emergency crews varying from 4 to 6 men are available in each section for storm duty, permitting round-the-clock operations when necessary. The entire organization is closely knit by the Turnpikes own system of microwave and VHF radio channels. There are 75 mobile and 28 fixed units with 16 maintenance trucks equipped with sets. Two of these trucks are stationed in each section. Equipment for ice and snow control include: 24 1-way snow plows; 32 pony blades; 8 reversible plows; and 6 V-type plows. Trucks are equipped with rear-mounted mechanical sand spreaders to distribute a mixture of 8 percent rock salt with sand and cover most of the 24-ft. roadway at a single pass. To keep track of weather conditions, the Turnpike headquarters, by radio, collects data four times daily from toll collectors, on conditions at each interchange.

"Turnpikes Are Expected to Be Snow Free." By L. W. Newcomer, Chief Engineer, Kansas Turnpike Authority. PUBLIC WORKS, August, 1958.

Spring "Clean-Up" Week Really Means Something in Peoria

Cleanup Week in Peoria, Ill., is sponsored by the Peoria Association of Commerce Fire Prevention Committee. With publicity via newspapers, radio and TV, the Fire Department encourages people to get the winter's accumulation of inflammable rubbish out of basements, alleys, back yards and vacant lots. Door-to-door inspections are made prior to and during Cleanup Week, under the supervision of the Chief Fire Inspector for the Bureau of Fire Prevention. Property owners are advised when necessary to take action in the interest of fire safety and elimination of a nuisance. For

now a residual pre-emergence herbicide with

7 *safety features*

GEIGY SIMAZINE* 50W

STOPS WEEDS AND FIRES BEFORE THEY START

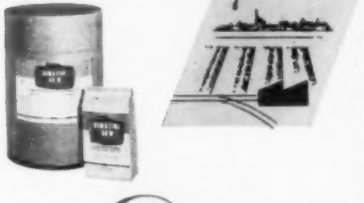
Weed control is an old problem to maintenance men. Now Geigy's pre-emergence herbicide Simazine 50W provides a new and better solution – makes weed control *easier* because it is long residual; *safer* because of its Seven Safety Features; and *more effective* because it stops weeds before they start.

ONE APPLICATION PER SEASON

Simazine 50W reduces application costs in time, labor and material. At the rate of 10 lbs. per acre, one pre-emergence application controls annual grassy and broadleaf weeds for an entire season. At the rate of 20 lbs. per acre, one pre-emergence application controls most perennial weeds as well as annuals.

SEVEN SAFETY FEATURES

Maintenance men especially appreciate Simazine 50W's Seven Safety Features. This new herbicide is safe to humans and animals, non-flammable, non-corrosive, non-abrasive, and presents no conductivity problem or drift hazard. Check the panel for these and all of Simazine 50W's Seven Safety Features – and compare.



WRITE FOR TECHNICAL DATA

For additional product data, Technical Service information, or the name of your nearest Simazine 50W distributor, address: Geigy Agricultural Chemicals, P. O. Box 430, Yonkers, New York.

check these **SIMAZINE 50W** *7 safety features*

1. **SAFETY TO HUMANS AND ANIMALS** Extremely low toxicity. No need for protective clothing.
2. **SAFETY TO ADJACENT VEGETATION** Minimum lateral leaching. Remains where it is applied.
3. **SAFETY TO SPRAYING EQUIPMENT** Non-corrosive or abrasive to equipment.
4. **SAFETY NEAR ELECTRICITY** Relatively low electrical conductivity.
5. **SAFETY FROM DRIFT HAZARD** Works through roots—little or no toxicity to foliage.
6. **SAFETY FROM FIRE HAZARD** Non-flammable. No application hazard.
7. **SAFETY ON VALUABLE LAND** Not a permanent soil sterilant.

GEIGY AGRICULTURAL CHEMICALS
Division of Geigy Chemical Corporation
Saw Mill River Road, Ardsley, New York

200 years Geigy

ORIGINATORS OF Geigy *DDT INSECTICIDES*

* "SIMAZINE" is a trademark of Geigy Chemical Corporation

this week the street department crews supplement the private garbage contractor's work in various special ways. City crews go into the business area and help on accumulations that require a truck with men and shovels. A dump truck with driver and 3 shovelers will average 4 or 5 loads per day. Elsewhere over the entire city, all men who can be spared other duties are used to man special trucks for hand pick-up. During the week the city's two mechanical sweepers give the 160-mile street gridiron a good cleaning and the street flusher is used on any blocks that can be flushed to eliminate or reduce the need for sweeping. Each sweeper operator is given route assignments planned around a sweeper dump. This dump may be on a vacant lot, and the refuse is later hauled away to the permanent dump.

"Spring Clean-Up Week Really Means Something in Peoria." *Street Engineering*, July, 1958.

Gatwick Airport
A Triumph of Civil Engineering

Several features of Gatwick Airport include the unique meeting of 3 means of transport in one place. In the direct rail link with London, the platforms are connected to the terminal building by covered way which leads into the concourse at first floor level. Access for motor transport is given by approach ramps to an elevated roundabout 22 ft. above ground. This allows uninterrupted flow of main road traffic under the terminal building. Another new feature is the passenger-handling system, in which piers are to be used to get passengers to and from waiting aircraft. The aircraft will be parked on areas specially reserved on the apron, and will then taxi to the runway along fast taxiways. The main runway is 7,000 ft. long and 150 ft. wide. Both transverse and longitudinal joints on the runway are at 15-ft. centers, making a pavement of interlocking squares. To prevent loss of moisture, a polythene membrane has been laid between the dry lean base course and the pavement quality concrete. The membrane, 3/1,000th inch thick, reduces the restraint and friction between the 2 slabs. The flexible shoulders are each 75 ft. wide and consist of a subbase of ballast on which is laid 4 ins. of dry lean concrete covered with a tar-based surfacing, and finished with pink chippings. The 3 main aspects of the telecommunications include: a) Radio and radar navigational aids to aircraft; b) radio communications facilities; and c) fixed services, under which heading are included details of the semi-automatic signals center and of the telephone facilities at the airport.

"Gatwick Airport—A Triumph of Civil Engineering." *The Surveyor*, June 14, 1958.

County Problems and How They Were Solved

Douglas County, Wash., has 1700 miles of county roads. Sand dunes were creating quite a problem on a road along the Columbia River. The county department agreed to collaborate with the adjoining landowner to control and level the dunes. The farmer used his portable irrigation system to wet the sand for almost a week. The soaking was necessary to allow moving of the material by a bulldozer. After the dunes were cleared by the bulldozers, the landowner completed the job by seeding with alfalfa for cover and a planting of an orchard. By using 2 motor graders chained together, and by lengthening the tie, any size fill slope or shoulder along a road can be maintained by the county highway department. Most of the farmers in the county own complete spray equipment, so the

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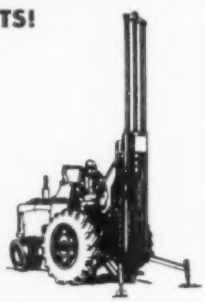

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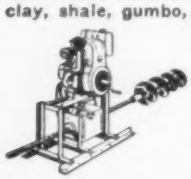

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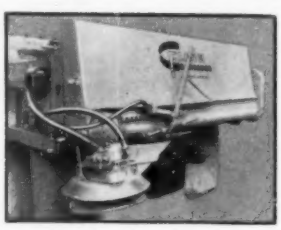

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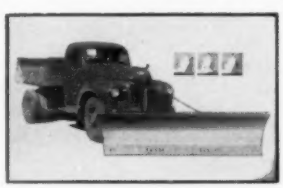

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electrical characteristics 3
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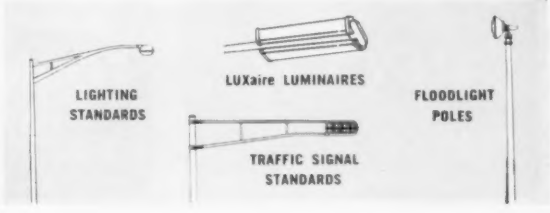

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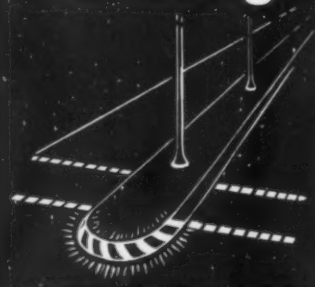

Highway accidents are taking a ghastly toll of maimed and dead. Reflective glass bead installations of Flex-O-Lite Type H Safety Spheres clearly define traffic hazards—work effectively day and night in the cause of safety. Flex-O-Lite Type H Safety Spheres get their warnings across quickly with powerful impact. For low first cost—low upkeep—fully effective protection—specify Type H Safety Spheres by Flex-O-Lite. Write for details.

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county engineer made arrangements with the farmers to spray the roadsides. If a farmer wants treating materials, he reports to the county agent for a permit, requesting the herbicide and marking the section layout for appropriate road location. The agent then checks the area for type of noxious weed and determines the herbicide and the amount needed. This data is forwarded to the county engineer and he writes a specific purchase requisition for the exact amount of herbicide material for the specific individual. After the material has been applied, the agent inspects the weed site for application and killing results, making sure that none of the material was used for private purposes.

"A Few County Problems and How They Were Solved." By Pat Thomson, Douglas County Engineer, Waterville, Wash. *Better Roads*, July, 1958.

Other Articles

"The Quasi **Semiautomatic Deed Writer.**" This device consists of an adequate number of rubber stamps containing carefully selected extracts from a deed. The statements are double spaced and provided with long blank spaces to be filled in by pencil to permit each stamped phrase to be fitted to the case in point. By Christian Knudsen, Engineering Assistant, District 15. Texas Highways, June, 1958.

"Subsurface Drainage." This is part II of a 2-part article and deals with the planning of the subsurface drainage system. By J. R. Baittinger, P. E., Civil Engineer, Scotch Plains, N. J. The American City, July, 1958.

"Sales Tax Money Pays for **Street Improvements.**" Orange, Calif., initiates a program to upgrade secondary streets without reducing normal maintenance work or funds. By H. A. Casteel, Street Supt., Orange, Calif. The American City, July, 1958.

"Mowing the Nation's Biggest Lawn." **Caring for the wide shoulders and median strip** on the Garden State Parkway is a big job. Public Works, August, 1958.

"Spacing of **Vertical U-shaped Stirrups** in Concrete Beams." By W. I. Barrows, Barrows & Associates, Dayton, Ohio. Civil Engineering, July, 1958.

"How to Be Sure of **Treated Wood Piling.**" By A. P. Richards, Director, William F. Clapp Laboratories, Duxbury, Mass. Engineering News-Record, July 24, 1958.

"Treated Timber Substructures For Modern Bridges in Maine." Wood Preserving News, July, 1958.

"Preheated Aggregate For Two-Course Asphalt Surface Treatment." By J. P. Chaney, Senior Resident Engineer, District 14, Texas Highways, July, 1958.

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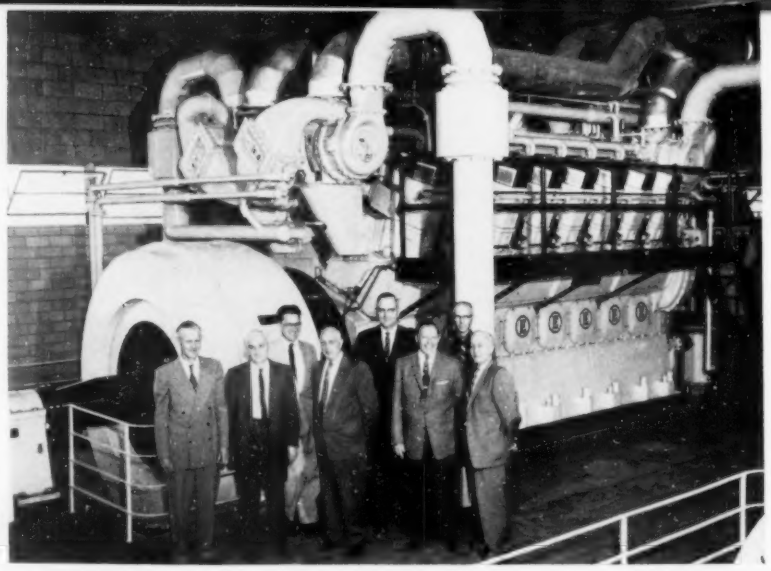


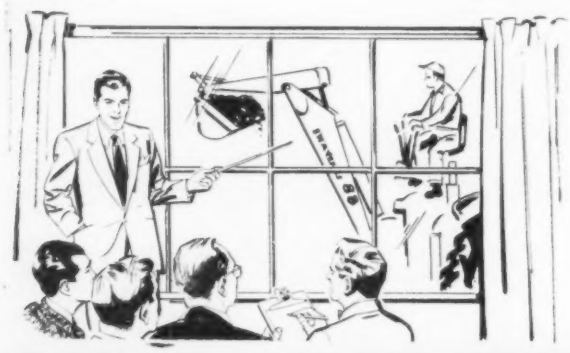
● DWARFED by big Enterprise diesel, Mayor and Councilmen view new installation.

WITH THE ADDITION of a new 16-cylinder 4,890 hp RV-16 Enterprise Diesel engine to power generating equipment rated at 3500 kw, the total plant capacity of Waverly, Iowa's, West power plant is up to 6,095 kilowatts. This latest improvement of Waverly's municipal electric utility was shown to the public at an open house on July 12 and 13, 1958. Cost of the major items of the recent plant enlargement totaled $771,817, with the dual-fuel, turbocharged diesel costing $534,000 of that amount.

In 1904, when the first municipal generating plant was built in Waverly, its capacity was 150 kw. Total capacity at two plants is now 9,440 kw. Last year, 18,148,400 kilowatt-hours of electricity was generated. The sale of electricity amounted to $403,361, and the plant served 2,282 power customers.

In 1957 the utility furnished 1,607,535 kilowatt-hours of electricity valued at $51,914 free to the City. Of this amount $22,750 was for street lighting; $19,418 for water pumping; $6,204 for sewage treatment; $2,091 for traffic signals; and the remainder for other city departments. The plant paid out $74,778 in salaries to employees and spent $90,675 for fuel and $126,247 for extensions and maintenance to the distribution system.

Merritt Bushby, as Superintendent of Municipal Utilities and City Engineer for Waverly, has carried the major burden of planning for the new Diesel and distribution system. Victor Etem of Associated Consultants, Minneapolis, Minn., was retained as a consultant for the project. The mayor of Waverly is John D. DeNeui and Milton Fangmier is Supt. of the electric plant and the water works.



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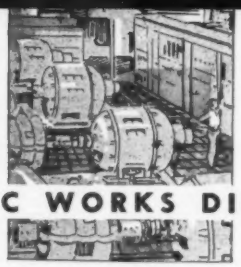


PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Pre-Planning for Annexed Areas

A recently completed regional development plan has enabled Greensboro, N.C., to develop and construct a water supply distribution program for the city and its newly annexed suburban areas. A comprehensive study of Greensboro and its suburbs indicated the water needs and present distribution lines in these areas. Afterwards a carefully blueprinted improvement program was developed and its main features were instituted immediately upon the completion of the annexation of surrounding suburbs which doubled the land area of the City. Nine months after the annexation, water service was made available to 75 percent of the 25,000 residents of the absorbed area, and the other inhabitants can be quickly and economically serviced whenever they request it. The first step in the overall plan was to design a trunk main system to take care of the estimated development through 1970. The proposed trunk system provides 75 miles of pipe lines at an estimated cost of $4,500,000. The improvements to the water supply and distribution system were financed through a $12,000,000 bond issue passed by the citizens of Greensboro by a vote of 3 to 1.

"Pre-Planning and Fast Action Win Water for Annexed Areas." By T. Z. Osborne. *Water Works Engineering*, July, 1958.

Treatment Plant Innovations

The 15-mgd South County Plant of the Saint Louis County Water Co. has a number of features that may be innovations in the field. It was designed as a low-cost but efficient water treatment plant that would be limited to summer daytime operation. Because of the supplementary nature of this supply the other two treatment plants—the 36-mgd North County Plant and the 85-mgd Central County Plant—it can be taken from service at night for filter washing, and during the winter for maintenance. Some of the features of this plant are: 1) A remote-operated river intake, consisting of submersible pumps, valves, and limit switches. 2) A sloping, earth embankment purification basin, containing all treatment process units, including filtration. 3) A suspended solids-contact lime softening unit, operated to obtain calcium carbonate near-stability by holding in suspension 50,000 ppm, or more, previously precipitated solids. 4) Flocculating drives which do not require a dry well. 5) Distribution of coagulant and chlorine across the 100-ft. wide treatment basin. 6) A submerged filter within the treatment basin. 7) A filter without clear well or rate-of flow controller. 8) Submerged, hydraulically operated butterfly filter valves and piping, which eliminate the need for the conventional pipe gallery. 9) A pitot tube and pneumatic controller for filter wash water. The facilities provided for treatment of the raw water obtained from the Meramac River include: 1) lime softening and stabilization with retained sus-

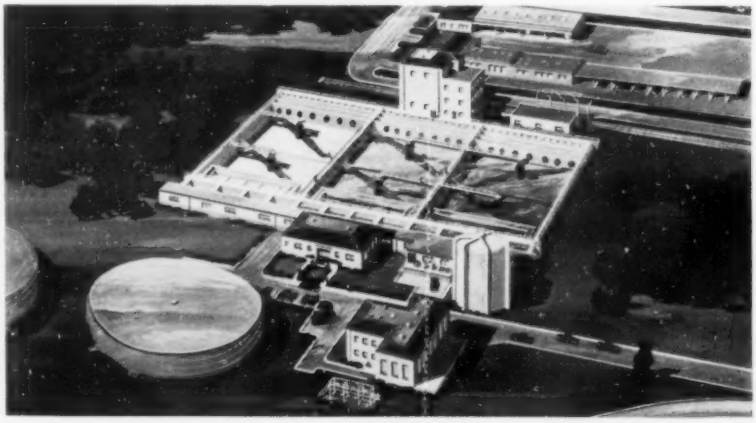
NEW WATER PLANT FOR FORT WORTH

THE NEW South Holly Water Plant at Fort Worth, Texas, has a normal treating capacity of 50 mgd and a pumping capacity of 135 mgd. Together with the old North Holly Plant, the city water system now has a rated capacity of 129 mgd. The new plant is designed to permit an ultimate development of the entire Holly Plant Site to an overload capacity of 250 mgd.

Components of the new plant include a 72-inch raw water conduit from the West Fork of the Trinity River; chlorine building; chemical headhouse; three sedimentation basins with continuous sludge removing facilities; 12 open filters; an administration building including filter center and laboratory; two 6 mg clear wells; and a high service pump station and appurtenances.

Control of the entire water system will eventually be possible from the water dispatch room of the high service building. Instruments will indicate supply, demand, pressures and storage. All booster pumping stations may also be operated by remote control.

The engineering firm of Freese & Nichols of Fort Worth designed the plant. Uel Stephens is director of the Fort Worth Water Department, and Ralph Hardy is assistant director. General contractor was C. H. Leavell and Co. of El Paso, Texas. The plant took four years of planning and construction, and cost totaled $5,621,000.



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● If these were standard manually-operated gravity filters, it would take 3 husky well-trained men (3 one-man shifts) to open and close heavy valves for shutoff, backwash and rinse. If they were table-controlled automatic filters, the initial cost would be almost *doubled.*

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Permutit Valveless Filters use a simple design employing basic hydraulic principles to do the "thinking" and the work . . . replacing expensive valves, flow controllers and hydraulic or pneumatic control systems. Initial installations have been approved for treatment of drinking water as well as process water.

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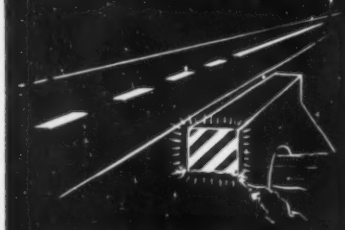

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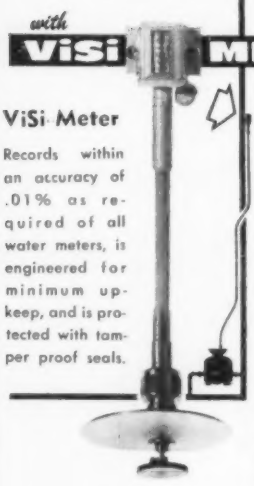

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pended solids; 2) coagulation-filtration; 3) free residual chlorination; and 4) taste and odor control with activated carbon.

"Treatment Plant Innovations in St. Louis County, Mo." By Herbert O. Hartung. Jour. *AWWA.*, July, 1958.

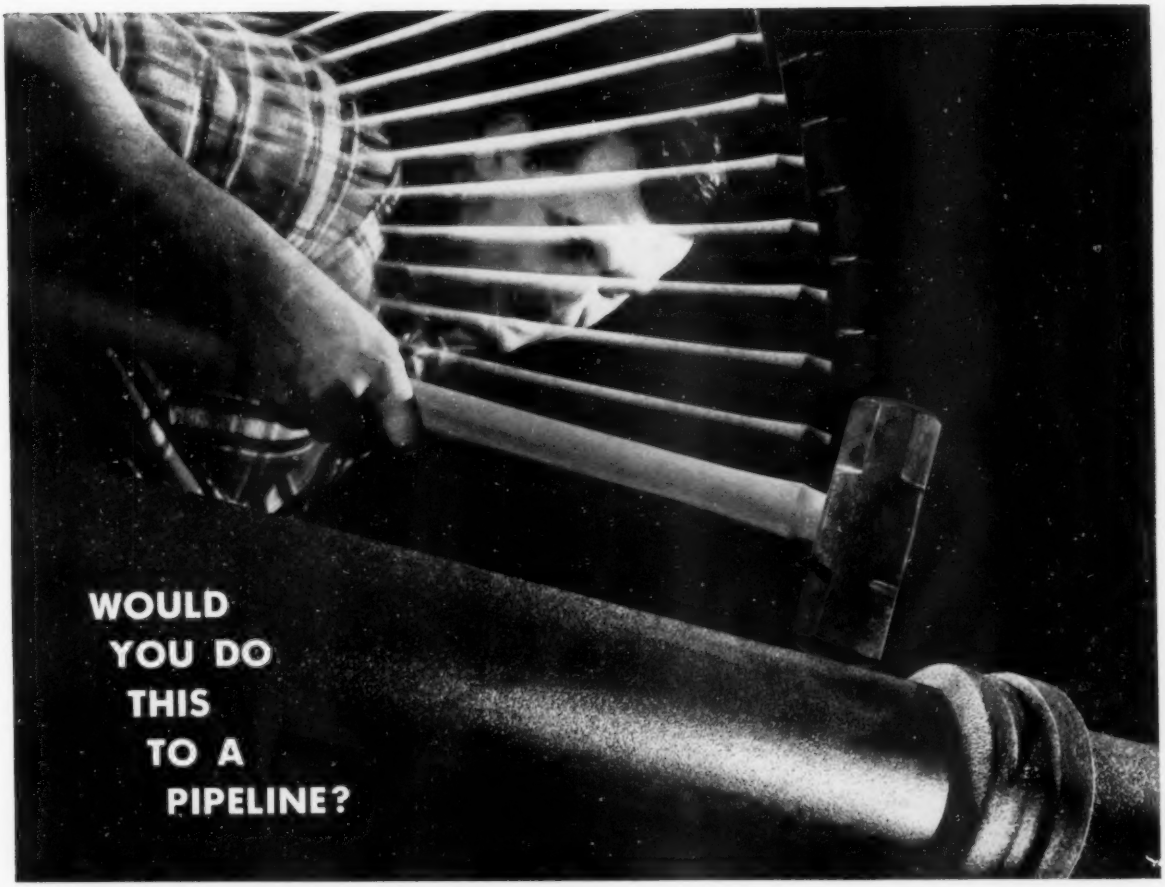
Fire Hydrants

The primary objective in installing a fire hydrant is to obtain a water supply adequate for the fire apparatus responding to the fire. The modern fire hydrant, a relatively recent innovation, has had a long historical development which is reviewed in this article. Because the determination of the proper hydrant for each installation is important, the following guides have been derived for application in the selection of hydrants for an existing system: 1) If the working pressure in an area is 100 psi or over and the pipe network is composed of 6-in. (or larger) pipe, 2½-in. outlet hydrants will deliver sufficient quantities of water for fire control in scattered, one-story, single family residential districts. 2) If the working pressures are below 75 psi and there are considerable amounts of 4-in. or tuberculated 6-in. mains in the system, hydrants with outlets at least 4 in. in diameter should be used.) 3) In a weak system or with lower pressures, significant improvement in flow can be obtained by installing the most efficient hydrant available to the local water system.

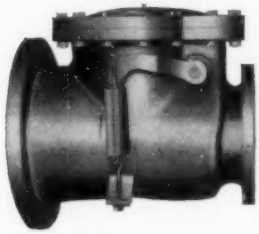
"Fire Hydrant Efficiency and Standards." By G. A. Wyss and W. J. Burns. *Jour. AWWA.*, July, 1958.

Ten Commandments of Water

Based upon forty-four years of engineering experience and association with more than 200 water supplies, the author has selected a list of so-called "Ten Commandments" or important principles, the observance of which will help produce satisfactory water supplies and will provide economies during present construction and in the future. The "Ten Commandments" are listed only very briefly with the understanding that they are more thoroughly discussed in the article. 1) Secure and use records of past water use and pumpage for 10 to 30 years in design predictions. 2) Estimate the future population and water use for at least 30 years in —ultimate capacity for some facili-



CHECK VALVE SLAMMING CAN BE JUST AS BAD!



Even moderate slamming can raise cain with a pump discharge line, causing leakage, throwing pipes out of line or causing other damage that may not be discovered for years. And heavy slamming can cause serious damage and service interruption.

However, check valve slamming CAN be prevented . . . by installation of Ludlow and Rensselaer List 340 non-slamming check valves. These are non-slamming under most severe conditions, by virtue of adjustable spring tension, and are recommended as standard equipment wherever slamming is likely to occur.

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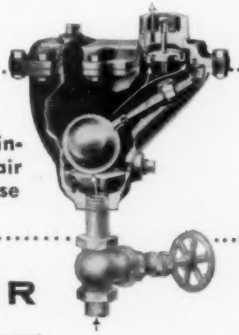

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ties and 10 to 15 years for others. 4) Design and construct for maximum daily capacity plus fire protection requirements. 5) Include instrumentation and automatic control for economy of operation and more complete records. 6) Provide stand-by equipment for emergencies. 7) Provide for construction costs and emergencies in estimating project costs. 8) Provide effective financing. 9) Assure adequate and balanced water rates. 10) Keep operation records and size and location records of facilities.

"Ten Commandments" of Water Works Design and Operation." By John A. Fulkman. PUBLIC WORKS, August, 1958.

All-Pneumatic Controls

When Dubuque, Iowa, was faced with the need to augment its water supply system to keep abreast of a 25 percent increase in population and a 50 percent increase in water consumption since 1940, it chose the Mississippi River as its source and an all-pneumatic instrumentation method for controlling and automating its new 10-mgd water filtration and softening plant. Instead of delivering the raw, muddy river water directly into the treatment plant advantage was taken of a natural underground sand and gravel formation as a filter. Pumps deliver the water from the wells to the treatment plant. First aeration, then chemical feeding, followed by flocculation and clarification, prepare the water for filtration. An all-pneumatic control system was selected to assure uninterrupted delivery of safe water, plus good operating efficiency with a minimum of personnel, capital investment, and annual operating and maintenance expenses.

"Dubuque Automates New Plant With All-Pneumatic Controls." By J. A. Hall and M. W. Williams. *Water Works Engineering*, July.

Automatic Analysis

The newly designed power plants using higher steam generating temperatures and pressures require higher quality water with an absolute minimum of dissolved scale-producing compounds, including silica. Recently a new piece of equipment was developed by the author's company for the automatic determination of the silica and hardness content of demineralized water. Basically the "Quantichem" instruments are Colorimetric analyzers based on an application of the

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Beer-Lambert law. Simply stated, this law of physical chemistry states that if light of a given intensity and wave length shines through two samples of colored solutions for equal distances, the difference in the intensities of light emerging from the solutions will be proportional to the difference in the concentrations of the coloring agent in the solutions. This article describes in detail the procedure by which this principle is put into practice in the design and operation of the silica and hardness analyzer. These instruments are equipped with recording units with high-low limit switches that can be used to actuate an alarm of some type. They can also be used in making the operation of the demineralizer entirely automatic, so that it will be regenerated and returned to stream without the operator being present. The hardness analyzers are of two standard ranges—0 to 3 and 0 to 5 mg per liter calculated as $CaCO_3$. The silica analyzers have standard ranges of 0 to 0.5 and 0 to 0.05 mg per liter calculated as SiO_2.

"Automatic Analysis for Silica and Hardness." By George Schneider. *Water and Sewage Works*, July, 1958.

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Now that we have started making the new Ringstyle Valve for copper connections, we've wondered, too, why we didn't think of this simple idea sooner. Now that we have, a patent is pending.

Of course we were proud of the old arrangement. When we introduced the Ringstyle Valve in 1938 it was a brand new idea and the meter coupling nut attached to the valve was an important development in meter setting. But the old design, with its loose ring for connecting the valve to copper, had its disadvantages.

But look what we've done with this new one. We've built the beveled end right onto the valve itself and reversed the thread arrangement. Thus, the standard copper tube nut fits right on the new Ford Ringstyle Valve for an easy-to-make, leak-proof joint. The capacity is not reduced — The appearance and utility are improved.

The men who install this new Ford Ringstyle Valve will certainly approve this change because there's no loose ring to drop into the mud or dirt in the ditch. Connecting the valve to the copper service line is simpler, easier and quicker.

Former Design

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Other Articles

"Use of Hexadecanol in **Reservoir Evaporation Reduction**" A review of USPHS research on the toxicity, microbiological stability and effectiveness of hexadecanol as an evaporation retardent. Bernard B. Berger. JAWWA. July, 1958.

"Developments in Artificial **Ground Water Recharge.**" A Task Group Report. By John J. Baffa, (Chairman). JAWWA., July, 1958.

"Research and Experiments in **Evaporation Reduction.**" A review of evaporation control methods with a more comprehensive discussion of research and experiments dealing with monomolecular film method. By Uel Stephens. JAWWA., July, 1958.

"Use of **Tank Car Chlorine.**" A sizable savings in material costs has been made through tank car chlorine instead of ton containers at the Flint, Mich., water treatment plant. By R. M. Harwood and R. How. Water and Sewage Works, July, 1958.

"Membrane Filter Media Studies." This article is the result of a serious attempt to determine the reasons for deficiencies and variations in the millipore filter results. By Jos. A. McCarthy and J. E. Delaney. Water and Sewage Works, July, 1958.

• • •

WASTE PAPER SALVAGE IN ENGLAND

WASTE PAPER salvage has had a rather prince or pauper status in England over the past 40 years. A study made for the Institute of Public Cleansing by N. G. Wilson, Engineer and Manager, Lighting and Cleansing Dept., Edinburgh, presents much valuable data on the problem of paper salvage and recovery. The report is available in booklet form.

Collection by local authorities of waste paper for resale is not peculiar to times of shortage of wood pulp or other paper making materials, and may not be solely for economic reasons, but to improve the appearance of the community. However, a great impetus was given to this activity by the first world war; while during World War II, the controller of salvage made it compulsory for all communities of 5,000 population and more to collect waste paper. Buying and selling prices were controlled. Restrictions were lifted in 1946, but a bonus system to encourage salvage continued to the end of 1950.

Waste paper collected by local authorities reached 285,000 tons in 1949; in 1955, the consumption of waste paper by paper mills aggregated 758,000 tons.

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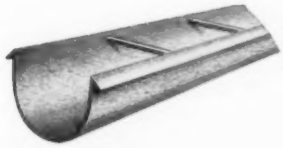

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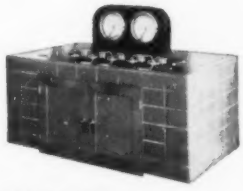

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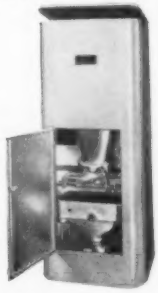

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It is estimated that one ton of waste paper is collected per month per 1,000 population. This will amount to 2,400 tons per year for a community of 200,000. When loose paper is included in refuse, it is compressed by the weight of the other wastes to about 125 pounds per cubic yard; and at this density, the 2,400 tons of paper would add 38,400 cu. yds. to the total volume of refuse to be collected. Average density of normal refuse, which would aggregate about 50,000 tons per year for a community of 200,000, is 500 pounds per cubic yard. Therefore inclusion of the paper in the refuse would swell the volume from 200,000 cu. yds. to 238,400. This is a factor in determining whether waste paper should be collected with other refuse or separately.

An analysis of the refuse where paper was not collected separately showed the waste paper content at 6.59 percent in the December-February quarter, and 10.99 percent, 18.12 percent and 11.07 percent for the succeeding quarters. The figures represented 123 lbs. per house per year or 2.65 lbs. per house per week, with a summer production of 2.98 pounds.

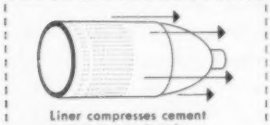
If paper is collected at the same time and by the same vehicles, the paper being tied in bundles or bagged, economical handling presents a problem. A separate compartment in the vehicle may be used; bags or baskets of paper may be hung on the sides or attached to the rear of the collection vehicle; or a trailer towed by the vehicle may be used.

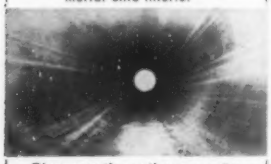
With weekly refuse collection, 500 houses being served daily, the maximum potential amount of waste paper collected per day will be 500 x 2.98 lb. = 1,490 lbs., and, as the density of bagged waste paper is about 90 lb. per cu. yd., total space occupied will be about 16 cu. yds. Assuming vehicles with a volumetric capacity of 12 cu. yds. and running three loads per day, a space of more than 5 cu. yds. would have to be provided in the vehicle to contain all the paper from these houses; hence the greater popularity of providing the paper accommodation in sacks hung on the back, and which, when full, are carried on top of the vehicle or in trailers.

With rear loaders, having no separate salvage compartment, difficulty is found in dealing with paper collected at the same time as the refuse. Only with difficulty can trailers be attached and, at the same time, provide reasonable facilities for loading the vehicle. Appendages, such as bags or boxes, may have to hang on the sides, where they may cause the overall width of the vehicle to exceed that permitted. Hung on the rear, they may impede the access of loaders to the vehicle. With all these disadvantages, these methods are utilized in various parts of the country.

Collection by separate vehicles is widely practiced in regard to business premises where comparatively large quantities of paper, compared to households, are obtained per call. Economics of separate collection from households require careful study as the maximum potential average yield is only 2.98 lbs. per house per week. In general, collections are made only once in two weeks; householder cooperation in placing sacks of paper at the curb is required, with collectors preceding the vehicle to remove bags to a central point for quick loading; and vehicles of low cost operation may be employed. Also, refuse collecting vehicles may be used in the forenoon for refuse and in the afternoon for salvage.

When waste paper is in reasonable demand and prices are sufficiently attractive to offer a prospective credit balance over collection





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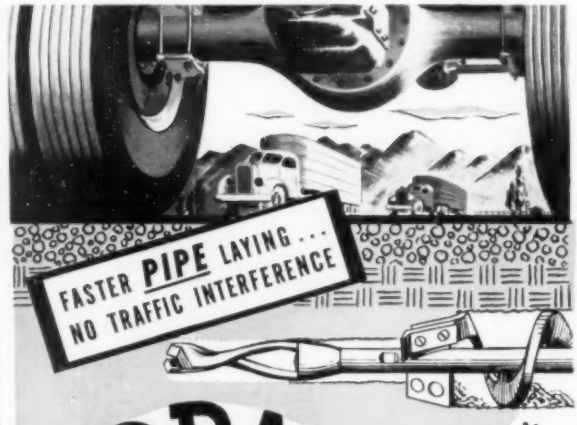

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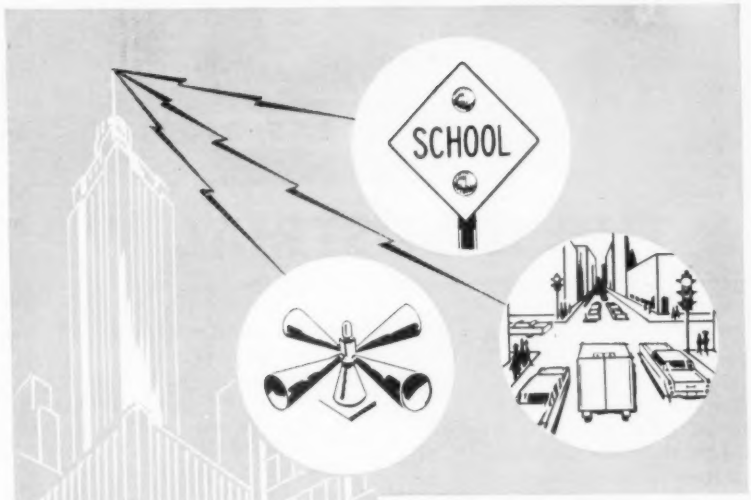
costs, its acquisition from business premises will be desirable. To collect from such premises, many cities find it convenient to utilize vehicles specially set aside for the purpose, as, generally, there is so much paper to collect that it is not always practicable to collect it at the same time as the ordinary refuse. Paper in sacks, or in the form of flat-packed cardboard or strawboard, has a comparatively low weight to volume ratio and, accordingly, a very large-sized vehicle body is required to get a pay-load. Assuming a density of bagged paper of 1 cwt. per cu. yd., it will be noted that an outsized body of 20-cu. yd. capacity would only get a ton if fully loaded.

The contents of four sacks of waste paper collected from households were emptied into a large box and manually compressed to a volume of one cubic yard. The weight was 89 lbs. 3 oz. Analysis showed newspapers to weigh 35 lbs., magazines 19 lbs., and colored cartons 12 lbs. The remainder was represented by letters, envelopes, grocery bags, shavings, wrappings, brown paper and strawboard.

Decision as to the degree of grading will depend on the tonnage of paper involved, price differential between graded and mixed paper, market demands, labor and facilities available and similar factors. However, all collections must be subject to some form of sorting, if only to remove contraries. In the simplest method this will be a cursory examination when loading the balers, with a view to excluding contraries or contaminants. By analysis, chief contraries, in order of quantity, were found to be string, rags, carbon paper, chocolate wrappers, metal milk bottle tops, straw, contaminated paper and tar and bitumen-lined cardboard, wood wool, tins, bottles, office stamps, bread, fruit and meat. Even simple sorting will grade out cardboard and strawboard. The term "simple" is relative. It may be possible, with small collections, to heap the paper on the floor in the vicinity of a baling machine and lift and feed it into the baler manually, but large tonnages, regardless of the degree of grading contemplated, may entail mechanization of the sorting, grading and feeding arrangements if labor requirements are to be kept within reasonable limits.

The situation in respect to waste paper salvage is different in the United States than it is in England. However, this excellent study contains basic information of interest and value to all responsible for refuse collection and disposal.



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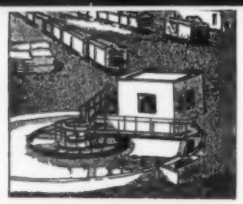


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Producing Yeast From Whey

More than 12 billion pounds of whey are produced annually by the cheese industry, and 75 percent of this amount is wasted. Consideration has been given to converting it into yeast for supplementing animal diets, but large-scale production has not been undertaken because of production costs. The length of time previously reported as required to produce the maximum net weight of yeast was 12 to 24 hours. In a laboratory study it was found that by inoculation of the whey with large quantities of yeast (up to one-half the final amount) the net increase in yeast weight in 3 or 4 hrs. is as great as that produced using smaller inocula over longer periods of time. It was found that sterilization of the whey and removal of precipitated protein was unnecessary; the problem of contamination was minimized by the large inoculum and the short growth period. The process is aerobic and requires a proper supply of oxygen. It was also found that the addition of sources of nitrogen and phosphorus is necessary for good growth. The optimum initial pH range is 5.0 to 5.7. The yeast concentration used in the inoculum is 2×10^9 cells per ml.

"Whey Utilization—Growth Conditions for *Saccharomyces Fragilis*." By A. E. Wasserman, W. J. Hopkins and Nandor Porges. *Sewage and Industrial Wastes*, July, 1958.

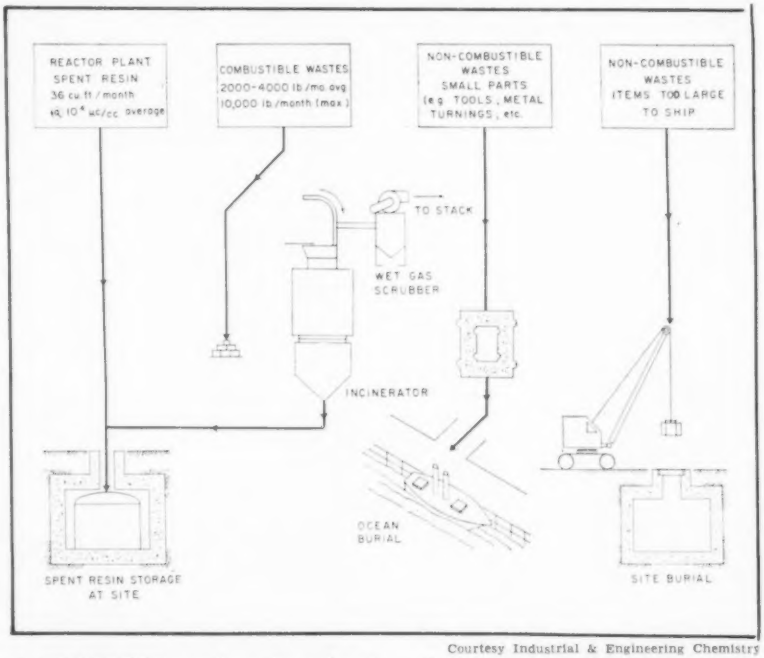
Nuclear Power Plant Wastes

With the nuclear power plant at Shippingport, Pa., situated in a populous area, considerable engineering effort was involved in designing a system for waste disposal. Ion exchange was selected as the method for treatment of the liquid wastes from the pressurized water reactor on the basis of some evaluation research and a lower cost compared with other methods. In disposal of spent resins, it was decided to flush the material directly into an underground storage tank, where the solid matter is settled and the supernatant is separated for further treatment. The combustible wastes are incinerated, and waste gases from various operations in the plant and those separated from the liquid waste are allowed to decay before being discharged in a diluted air stream through a stack. All of the non-combustible solid waste except contaminated equipment is flushed to the spent resin storage tanks. The equipment is encased in concrete and buried; small items at sea and the larger, on the site. Criteria for treatment of various effluents were established as one-tenth the maximum permissible concentrations listed by the Bureau of Standards. All waste streams will be sampled as they enter the disposal system. Effluents following treatment can be monitored and returned for further treatment if necessray. This flexibility, along with the basic batch-type of processing will minimize the danger of discharging wastes exceeding the criteria radioactivity. An off-site monitoring program for measuring background radioactivity was commenced in 1956; this will continue after operation is started for detection of any significant changes in the environmental conditions.

"Radioactive Material Control at the Shippingport Atomic Power Station." By J. R. La Pointe and R. D. Brown. *Industrial and Engineering Chemistry*, July, 1958.

Activated Sludge for Chemical Wastes

The liquid wastes from American Cyanamid's Bound Brook, N. J., plant, amounting to 20 mgd, result from the manufacture of pharmaceuticals, rubber chemicals, pigments, plastics, and dyes. They include process waters, cooling waters and domestic sewage. The pH is about 2.0, and the organic load averages 40,000 lbs. per day of 5-day BOD. A sump and pumping station deliver the waste to a 12-mg lagoon which acts primarily as an equaliza-


REACTOR PLANT SPENT RESIN 36 cu.ft./month to 10⁻⁴ μc/cc average
COMBUSTIBLE WASTES 2000-4000 lb./mo. avg 10,000 lb./month (max.)
NON-COMBUSTIBLE WASTES SMALL PARTS (e.g. TOOLS, METAL TURNINGS, etc.
NON-COMBUSTIBLE WASTES ITEMS TOO LARGE TO SHIP
TO STACK
WET GAS SCRUBBER
INCINERATOR
OCEAN BURIAL
SPENT RESIN STORAGE AT SITE
SITE BURIAL

Courtesy Industrial & Engineering Chemistry

● **TREATMENT procedures for radioactive solid wastes at the Shippingsport plant.**

for PLUS value

PERFORMANCE...

REX®

sewage and waste treatment equipment

What are the *plus values* you get in Rex Sewage and Waste Treatment Equipment that mean more efficient plant performance...lower operating and maintenance costs?

FIRST...*dependability!* Years of practical experience, a broad background of engineering knowledge, manufacturing skill, and the modern equipment that translates these into quality products combine to assure dependable operation under any condition.

SECOND...*efficiency!* Continuous research, product development and improvement...important pioneering in developing new methods and equipment to meet today's needs...add up to proven equipment that assures unequaled efficiency in performance.

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FOURTH...*flexibility!* The broad line of Rex Equipment offers you the widest choice of equipment. There is a type and size to exactly suit the requirement. No need to buy more than you need...no need to take less than you want.

For complete data on the *plus values* in Rex Equipment, write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wisconsin.

CHAIN BELT

tion basin. After neutralization with lime, the waste is discharged to a second lagoon having a capacity of 50 mg where the precipitated materials are removed and colors of the various waste components are allowed to mix. This plant has been supplemented by six activated sludge aeration tanks designed to provide a detention period of 24 hours. Sludge removal is effected in six 80-ft. diameter final clarifiers. The final effluent is chlorinated. Arrangements have been made with the Somerset-Raritan Valley Sewerage Authority to provide secondary treatment in the American Cyanamid plant of the effluent from a plant the Authority is building adjacent to the site.

"$4,500,000 Wastes Treatment Plant Dedicated by American Cyanamid Co." By Dr. J. C. Lamb, III. *Wastes Engineering*, July, 1958.

Food Processing Plant Wastes

Land irrigation is the best approach to the waste disposal problem of the canning industry providing several conditions can be met. Cover crops must be established on sufficient land, and the characteristics of the wastes must be such that these crops can accept the wastes and still produce a desirable cover crop. Favorable results have been reported from pilot and plant studies with anaerobic digestion. By-product recovery is a partial solution in some instances. Examples are citrus molasses and feed yeast from the citrus industry, silage from pea and bean canning, and soap and fertilizer from packinghouse wastes. Improvements in canning plant operation can often be helpful in reducing the volume of waste to be treated. Where adequate dilution is available without stream detriment, it should be considered an acceptable method.

"Treating Food Processing Wastes." By R. S. Ingols. *Industrial Wastes*, July-August, 1958.

Incineration of Combustible Wastes

An incinerator was designed by the Detroit and Diesel Engine Division of General Motors Corp. to handle the combustible wastes resulting from its manufacturing operations. The capacity, based on the combustion of fuel oil, was established at 15 gph. The unit is of the up-fired type with built-in explosion relief. It is 10 ft. high, with the outside diameter of the retort 30 in., and the total weight is about 4,500 lb., including 3,000 lb. of refractory lining. The wastes are received in covered storage receptacles throughout the manufacturing area, and are collected by an attendant to be discharged to an air-energized vacuum drum. Periodically the drum is hauled by a truck using a fork lift to the disposal site, where the vacuum drum is discharged to a storage tank. Air for the incinerator is supplied by a compressor and by inspirators. Bottled propane gas is used to ignite the liquid waste fuel at the incinerator burner. Temperature within the retort is normally in excess of 3000° F, resulting in the absence of smoke and ash.

"Waste Solvents from Diesel Engine Manufacture." By C. F. Gurnham and C. T. Gruner. *Industrial Wastes*, July-August, 1958.

Waste Problems and Public Relations

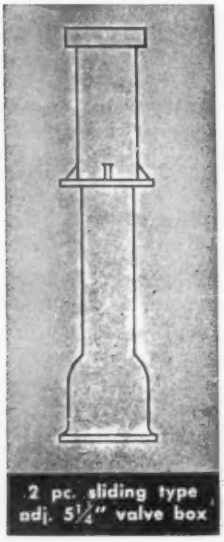
Industry is developing a progressive attitude toward pollution control problems. The factors involved in this progress include the adoption of a realistic attitude by industry toward waste disposal, recognizing that it is a problem to be handled in the best interests of the community; the use of expert

BUFFALO PIPE & FOUNDRY

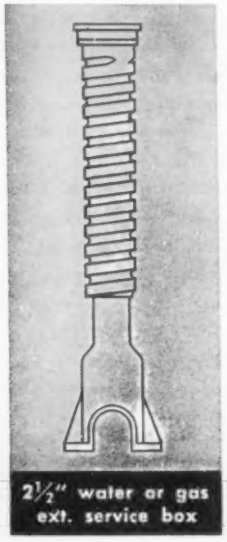
BUFFALO MUNICIPAL CASTINGS

are available in every size and style!

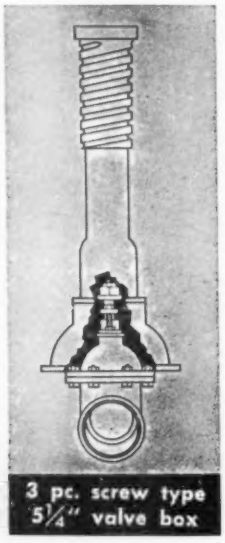
No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.



2 pc. sliding type adj. 5¼" valve box



2½" water or gas ext. service box



3 pc. screw type 5¼" valve box

Prompt quotations given on all your standard or special gray iron or non-ferrous castings.

Write or wire Dept. J for Bulletin M11.

SINCE 1930

BUFFALO PIPE & FOUNDRY CORP.

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Look for TYLOX Rubber PIPE COUPLINGS

Where infiltration problems are "tough!"

In Miami

ENGINEERS AND CITY OFFICIALS DEFEAT FLORIDA'S SUBAQUEOUS SOILS WITH TYLOX JOINTS TO KEEP "OUTSIDE WATER OUT" OF NEW CITY SEWERS

Miami's choice of TYLOX Rubber Joints for new sewerage lines not only solved infiltration problems presented by high water tables, but sped completion of the project, kept construction costs down and assured long-lasting *leakproof* lines. Here's how . . .

MORE PIPE DOWN PER DAY, with *fast-working* TYLOX to offset slow working conditions. TYLOX Joints are safely made in wet trenches, and backfilling can follow *immediately*.

NO JOINT FAILURES — Rubber TYLOX seals under *compression* . . . angularities in the line — or stresses from shifting soils or surface loads — are compensated by the natural resilience of the rubber.

NO CORROSION — Made of specially compounded rubber, TYLOX Joints are immune to sewerage and industrial waste acids and alkalies. *TYLOX outlasts the pipe itself.*

Write for complete details and more case histories on TYLOX, the *one* pipe joint that meets requirements of engineers, sanitary officials and construction men alike. Read the *facts* for yourself, and specify TYLOX to prevent infiltration, speed construction and lower cost on *your* next concrete or vitrified clay pipe project.

PROJECT: *City of Miami — Sewerage Expansion*

PIPE: *Reinforced Concrete — Manufactured by United States Concrete Pipe Co., Cleveland, O.*

ENGINEERS: *For the City of Miami:*
Arthur E. Darlow, Director of Engineers
W. T. Eefting, Project Engineer, Design & Specifications
Robert Banning, Chief Construction Engineer
W. B. Lewis, Engineer of Designs

HAMILTON KENT MANUFACTURING COMPANY
427 W. Grant St. Kent, Ohio
ORchard 3-9555

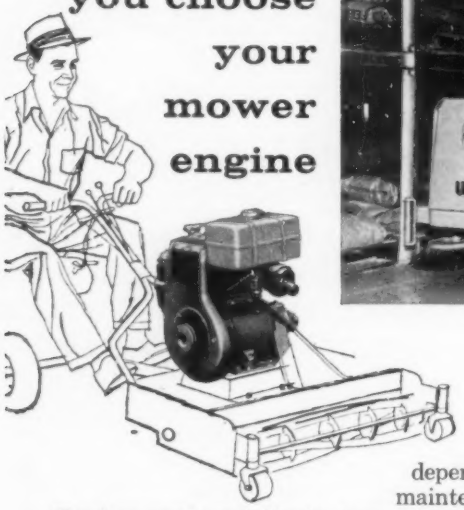
1900

"THE ONLY PERMANENTLY TIGHT LINES ARE LAID WITH RUBBER JOINTS"

advice in designing, installing and operating pollution control equipment; a willingness to install waste treatment equipment in spite of the limited return on the investment; insistence by plant management on the proper use of waste treatment equipment; and the insistence by management that extreme care be employed to prevent discharge of objectionable materials. An effective public relations program involves knowing not what to do: not ignoring the problems of pollution when they arise, not belittling the effects of pollution, not trying to persuade the public that pollution is an unavoidable component of industry, not trying to shift the blame, and not engaging in wishful thinking about the problem. Communication to the public should be on the basis of the true facts; a public relations program is not a means of covering up the problem. It can present the efforts and problems of the plant, showing evidence of a desire to participate in a logical and progressive program of pollution control.

"Industrial Public Relations in Pollution Abatement." By W. F. Bixley, B. F. Goodrich Co. *Sewage and Industrial Wastes*, July, 1958.

The PLANT MAINTENANCE FIELD can help you choose your mower engine



• What's needed — 8-hour performance, 16-hour or around-the-clock dependability? In the plant maintenance field, Wisconsin Engines work unfailingly, hour after hour, on many types of equipment.

The fact that you are reading this page, proves that you, too, are interested in this brand of dependability from *all* of your equipment . . . *including mowers.*

Choose Wisconsin-powered mowers and the operator-hours you pay for become workhours. Heavy-duty features, many of them found on no other mower-sized engine, insure season-after-season dependability.

Write for bulletin S-223 describing all Wisconsin Engines. *Electric starting available on all models.* 2,000 service stations . . . several near you.

WISCONSIN ENGINE POWER

first choice of professionals

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

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Flocculation of Industrial Waste Slimes

In attempting to determine some of the principles involved in the flocculation of slimes encountered in industrial wastes, the action of guar (Guartic, a product of General Mills, Inc.) on slimes prepared from silica, bentonite and iron ore was studied. The investigations followed the approach that a single molecule of flocculent adsorbs on the surfaces of two different slime particles, binding them together, with the process continuing until aggregates are large enough to settle. It was found by comparing two slightly different iron ore slimes that one containing a high percentage of silica was easily flocculated and that only the easily flocculated slime contained polyvalent electrolytes. The influence of the silica was studied by attempting the flocculation of a pure silica slime with and without the addition of lime. The improved flocculation in the presence of lime indicated that both the calcium and hydroxide ions exert an influence. With regard to bentonite, pH seemed to exert an influence in flocculation by guar. The explanation seemed to be that at high pH values the surfaces of the clay particles have a strong negative charge and exert a repulsive force on like particles.

"Flocculation of Slimes by Guar." By L. E. Peterson and J. W. Opie. *Industrial and Engineering Chemistry*, July, 1958.

Other Articles

"**Continuous Centrifuging** Used to Dewater Variety of Sludges. By John H. Jenks. San Leandro, Calif., claims advantages for dewatering a combined sewage and industrial waste sludge by centrifuging. Wastes Engineering, July, 1958.

"**Atomic Energy** Program for Waste Disposal. Part III." By Conrad P. Straub. The discussion of disposal of high level wastes, including ground and ocean disposal methods is continued. Industrial Wastes, July-August, 1958.

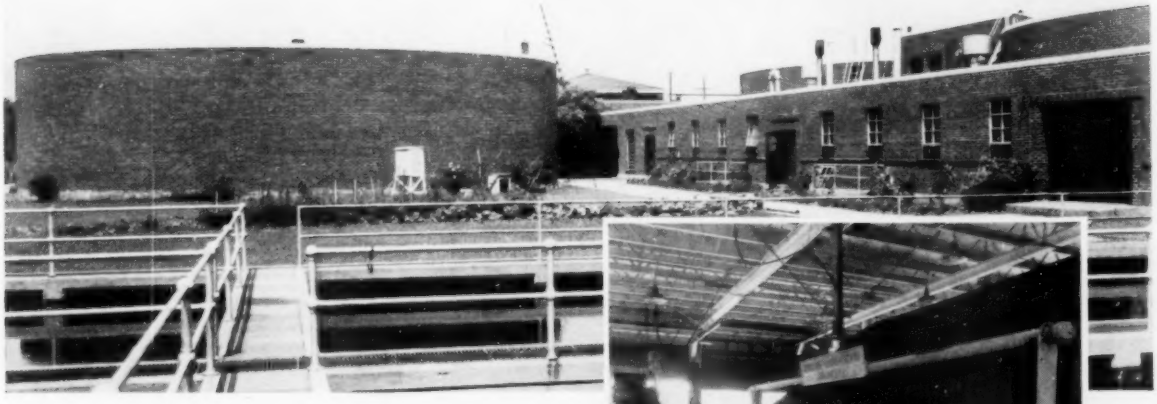
"Spent **Antibiotic Broth** at Eli Lilly and Co." By S. M. Paradiso and Dr. R. H. L. Howe. After the waste treatment plant was built, a higher biological loading than was anticipated made necessary treatment process revision without plant expansion. Industrial Wastes, July-August, 1958.

"Derby Corporation **Reconstructed Sewage Works** Opened." Plant will treat British celanese process effluent by alternating double filtration. The Surveyor, July 5, 1958.

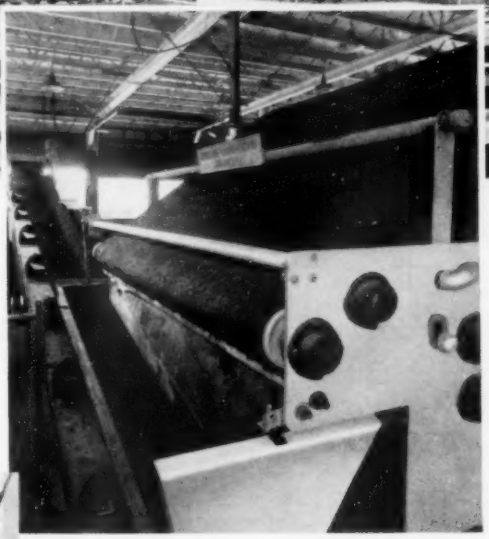
"**Tastes and Odors** in Water." By M. B. Ettinger and A. A. Rosen. The significance of wastes is becoming greater. Industrial Wastes, July-Aug., 1958.

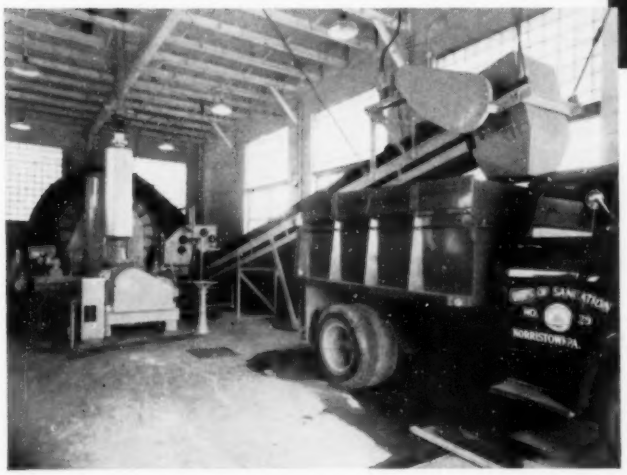
Another COILFILTER Case History

"First Aid" for Overworked Digesters



The 6,500,000 GPD Norristown, Penna., sewage treatment plant was placed in operation May 1, 1952. By the middle of 1953 population increase and industrial expansion had overloaded the plant's three digesters to the point that there were serious complaints about odor nuisance.





To solve this problem a 300 sq. ft. Komline-Sanderson COILFILTER was installed and placed in operation in July, 1954, working 7 days a week. Result — no more odors — no more overworked digesters — plenty of capacity for future growth. Present COILFILTER operation is 4 days per week. The plant's enclosed drying beds have not been used since the COILFILTER was installed.

Plant Superintendent: George H. Boone

KOMLINE-SANDERSON ENGINEERING CORPORATION

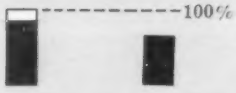
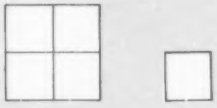
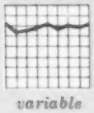
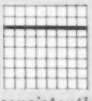
Peapack, New Jersey

MANUFACTURERS OF COILFILTER SLUDGE VACUUM FILTERS

Interesting Comparisons

For Men Faced With Increasing Demands on Municipal Water Supply

Since increased water supply frequently demands increased filtration capacity, these considerations are important to many municipal engineers.

RAPID SAND FILTRATION	DIATOMITE FILTRATION	
	100%	**capital investment** Based on the actual costs of existing municipal diatomite filtration systems as compared with engineering estimates and bids for equal capacity sand bed systems for the same municipalities.
		**space requirements** A conservative estimate, since a diatomite filter which will deliver 300 gallons per minute may occupy no more than 20 sq. ft. of floor space. On large installations, this differential may be as high as 10 to 1.
 *variable*	 *consistently brilliant*	**clarity** Because diatomite filtration is a "micro-straining"—a mechanical process—its positive action is more dependable than the uncertain effectiveness of floc formation with coagulants as used in rapid sand units.
partial	complete	**activated carbon removal** Diatomite filtration is the only commercially practical system which removes all trace of activated carbon used to adsorb undesirable taste, odor or color.
can be serious	0	**air binding difficulties** Independent tests made by municipal engineers, using water supersaturated with oxygen, showed no appreciable effect on the efficiency of a diatomite filtration system.
up to 10% of previous run	*a few gallons*	**water required for backwashing** Reports from many municipalities show that from 2% to 10% of the previous filter run is required to backwash the sand bed.
$ = $		**operating costs** This may be considered as an "average"; individual circumstances set the actual costs in any specific installation.

Dependable GLC Great Lakes Dicalite Diatomaceous Materials

Dicalite Bulletin BW-13 contains much information on Dicalite filtration of potable water—clarity, purity, bacteria removal (95% or better) together with data and operating figures on diatomite filtration systems now operating in certain municipalities. Write for it—it's free.

DICALITE DEPARTMENT,
Great Lakes Carbon Corporation
612 So. Flower St., Los Angeles 17, California

Disposal of Corrosive Wastes With Clay Pipe and PVC Coupling

The conveyance and disposal of wastes from the research center of Spencer Chemical Company, Johnson City, Kansas, presented a unique problem. No sewers were available and it was not possible to construct local treatment facilities because the center is located near residential property. To solve the problem, two separate lines and tanks were constructed. A 300-foot line of 4-inch vitrified clay pipe was laid from the laboratory building to a holding tank. Another line led to a separate tank constructed to hold sanitary wastes.

The sanitary waste tank constitutes a temporary installation; the tank for holding corrosive chemical wastes is permanent. It is designed for pretreatment of wastes, which will be discharged into city sewers when a municipal sewer system becomes available. At present, both tanks are pumped out daily, and their contents are hauled by truck to a disposal area.

The pipe lines to the tanks, which had to resist corrosive chemical wastes, were constructed of Dickey clay pipe with Dickey PVC couplings.

• • •

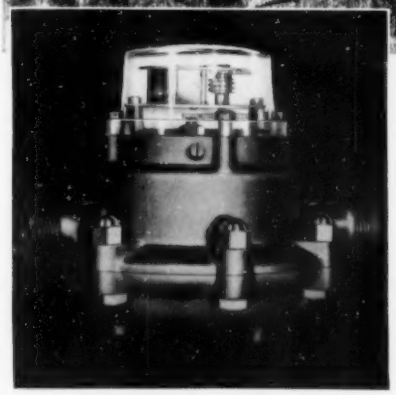
City Wins Top Safety Award

East Lansing, Michigan, has won the nation's highest traffic safety award for the second consecutive year, receiving the National Safety Council Award of Honor for highway traffic safety for 1957. The Award is based on the Council's evaluation of reports on traffic safety activities from 47 states and 1,255 cities in the United States. The city has a record of no traffic fatalities for the second consecutive year. East Lansing also scored outstanding recognition for public safety education and participation in a safety organization. Rounding out the high score for 1957 were outstanding ratings in traffic safety activities, maintenance of police accident records, school traffic safety education and continuation of the already fine traffic death record.

• • •

Refuse Collection in Alabama Municipalities

An ordinance has been adopted by Clanton, Ala., establishing a Sanitary Department. Collection and disposal of garbage and trash is a free municipal service. Garbage con-



Use American Meters with sealed plastic register box for pit installation.

METER DEPARTMENT FOREMAN

Boss of Installation and Maintenance

He says, "Dependable American Meters require so little attention, that we have more time for the efficient maintenance of other equipment."

He bases his statement on experience. He has found that American Meters are simplest in design and construction. The interior parts are rugged and have proper clearances that resist failure caused by small amounts of foreign material in the water. Precision manufacture assures that all parts — even chamber halves — are fully interchangeable, to simplify parts stocks and reduce maintenance costs.

He doesn't want his meter department bogged down with meter repairs . . . that's why he recommends American!

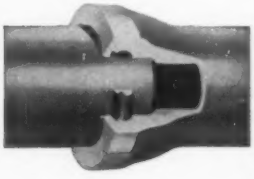
BUFFALO METER CO.

2920 Main Street • Buffalo 14, New York

tainers must have a capacity of not more than 30 gallons and must be of metal with a tightly fitting cover. On regular collection days, wastes are placed in front of the owner's premises for collection. It is unlawful for any person to sweep trash or garbage into the streets or sidewalks of the city or to allow refuse on his premises.

The Town of Brent has adopted an ordinance regulating garbage collection and disposal. The town will collect refuse twice weekly, and the ordinance levies a special tax of 75¢ per month on each water meter at private homes, schools, and churches and $2 per month on each business. This tax will be added to the monthly water bill. The town will not collect poisons, acids, caustics and explosives, but they will tell you how to get rid of them yourself. Garbage must be wrapped and placed in metal containers. Bulky rubbish must be bundled so as not to exceed six feet in length and 50 pounds in weight. It is unlawful to burn garbage anywhere in the town, and each property owner is responsible for keeping his premises in a sanitary condition.

These data are from *Alabama Municipalities.*



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Operating jack to complete joint.

Reduces Installation Costs

Tyton Joint Advantages include:

1. Lower installed cost.
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4. Gasket only joint accessory.
5. Tyton Joint pipe can be assembled in wet trenches if you keep the gasket, the gasket seat and plain-end of the pipe free of dirt.

Tyton Joint is furnished on Super DeLavaud Cast Iron Pipe conforming to ASA, AWWA, or Federal Specifications. The weight of Tyton Joint pipe is the same as bell and plain-end pipe of the same specification. Hydrostatic tests on restrained Tyton Joints prove that the joints withstand pressures exceeding the hydrostatic test pressures required in pipe specifications. Rubber gaskets and gasket lubricant are furnished with the pipe. Prompt shipment, 2" & 2¼" through 12" sizes.

Wire or write for free illustrated McWane's Tyton Joint Folder.

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McWANE CAST IRON PIPE COMPANY
GENERAL OFFICES & FOUNDRIES, BIRMINGHAM, ALA.
Sales Offices: Dallas Chicago Kansas City New York Birmingham

Status of Controlled Fluoridation in the United States, 1945-57

A report by the Dental Division, Public Health Service in Public Health Reports

OF THE approximately 118 million people in the United States provided water by community water supplies in 1957, 40.3 million (or about 1 in every 3 persons) in 3,534 communities drank water containing the minimum or higher level of fluoride recommended for optimum dental benefits.

Of these 40.3 million persons, 33.3 million in 1,631 communities are supplied water in which the fluoride level is controlled, and 7 million in 1,903 places use water naturally containing 0.7 ppm or more fluoride. Since 1950, the number of persons using water with a controlled fluoride content has increased by about 32 million. The number of communities has increased from 96 to 1631.

Fluoridated water is provided for a greater proportion of people living in large cities than in smaller communities. A majority of the Nation's cities having populations of a half million or more (12 of the 18) provide fluoridated water. Two of the five cities with populations exceeding 1 million (Chicago and Philadelphia), and 9 of the 13 cities with populations ranging between a half million and a million have instituted fluoridation. Of these 13 cities, only one, Houston, Tex., provides water which naturally contains fluoride at a level of 0.7 ppm.

Of places with less than a half million population, 32 percent of those with a population between 10,000 and 500,000, 17 percent between 2,500 and 10,000, and 5 percent under 2,500 have fluoridation programs.

The authority by which fluoridation is instituted is of interest. In 82 percent of the cities fluoridating, the governing body of the community authorized adoption of the measure. In 5 percent authority to fluoridate was obtained by referendums; in 4 percent the utilities commission authorized the measure; 9 percent of the communities did not specify authority or used other procedures in adopting fluoridation.

Fluoridation was discontinued in 13 communities providing water to 192,000 people during 1957. During the same year 3 communities, providing water to 66,000 people, reinstituted the measure after having previously discontinued it. During the years 1945 to 1957, a total of 94 communities discontinued fluoridation and 13 reinstituted it.

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Any Required Capacity! Erected Anywhere!

From its plants in Pennsylvania, Alabama, Indiana and Utah, General American supplies water storage facilities rapidly, efficiently and inexpensively.

The Field Erection Division maintains experienced crews and modern, efficient erection equipment throughout the country. No matter where you are, you are assured of immediate action and workmanlike construction.

General American steel reservoirs and standpipes are designed for lifetime trouble-free service. Our architects and engineers design exterior treatments to give them a clean modern appearance as well as utility.

Steel storage systems are elastic to protect against cracks when settling occurs, are not damaged by the action of frost, are lightweight, porosity-free, cost less to build and less to maintain than other types.

Your inquiries are invited.

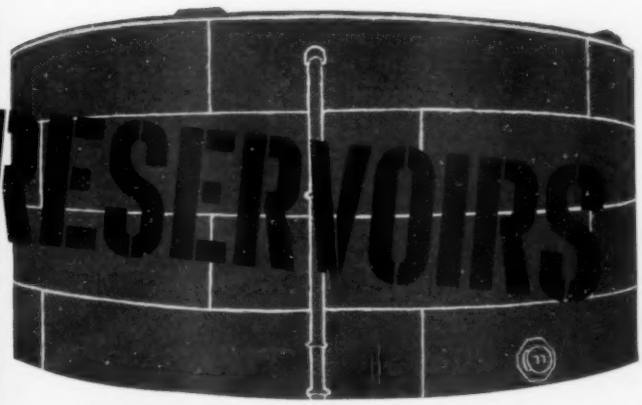
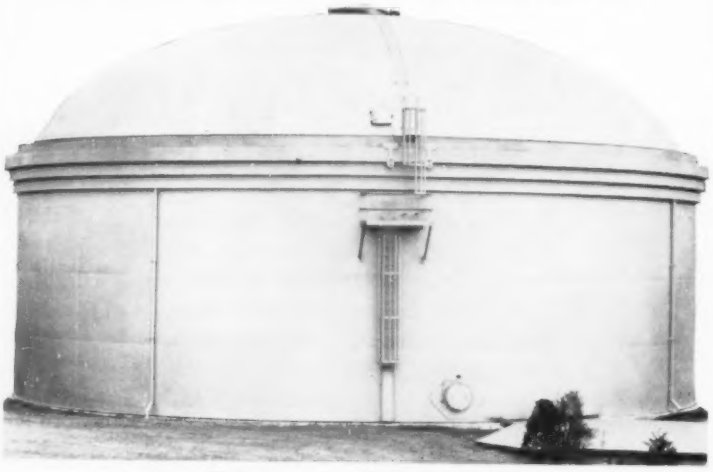


Plate and Welding Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street · Chicago 90, Illinois

1,500,000 Gallon Steel Reservoir For The Borough Of Oakmont, Penn., Municipal Authority



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FISHER TANK *Company*

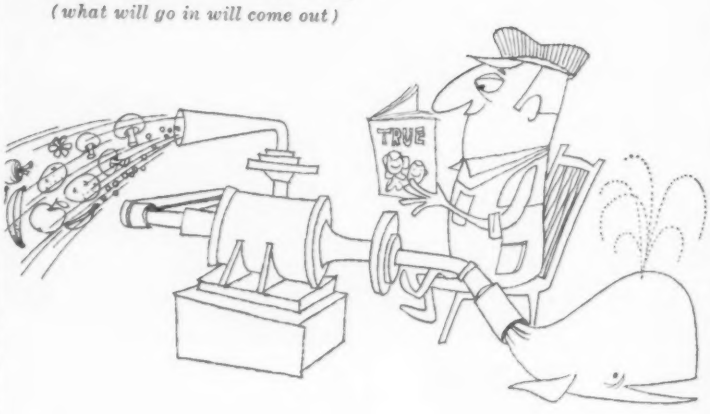
Chester, Pennsylvania

The Chester Engineers, Pittsburgh, Pa.
Consultants

WEMCO® the INCREDIBLE Torque-Flow Pump

pumps almost everything

(what will go in will come out)



secret: **recessed impeller; continuous open passage**

(completely non-clogging)

Western Machinery Company 650 Fifth St. • San Francisco, Calif.

Water supply systems are publicly owned in 84 percent of the communities in which the fluoride content is controlled. In cities with more than 500,000 people, all of the water systems are under public ownership; 88 percent of the systems are publicly owned in cities of from 25,000 to 500,000 population; 90 percent in places from 10,000 to 25,000; and 82 percent in places under 10,000.

The major increases in the population provided with fluoridated water during the next few years is likely to be in the larger cities. However, in the more distant future the greatest increase will probably be in the smaller places where today only 5 percent have fluoridation programs. It is in towns of 2,500 or less that fluoridation will need to make its greatest advances.

NEWS OF ENGINEERS

DR. CLARK A. DUNN, a professor of civil engineering and executive director at the office of Engineering Research at Oklahoma State University, has been elected president of the NSPE.

JAMES B. COREY has been appointed Director of Water Works Advancement by the American Water Works Association. He will undertake the development of the comprehensive program planned by the AWWA to improve nation-wide water service and management.

J. B. BLACKBURN has joined Harland Bartholomew & Associates of St. Louis, Mo. Formerly Associate Professor of Civil Engineering at the University of Maryland, Mr. Blackburn will be primarily responsible for transportation and traffic engineering, working from the St. Louis office.

F. W. MONTANARI, staff sanitary engineer of the Ohio River Valley Water Sanitation Commission, Cincinnati, has been elected secretary-general of the Inter-American Association of Sanitary Engineers (AIDIS). He will conduct his secretarial duties from his office in Cincinnati.

ADAM K. GRAFE is the new president of Koch and Fowler and Grafe, Inc., a Dallas, Texas, consulting engineering firm formerly known as Koch and Fowler. Under the reorganization, James D. Fowler and Earle W. Sudderth are vice presidents of the firm.

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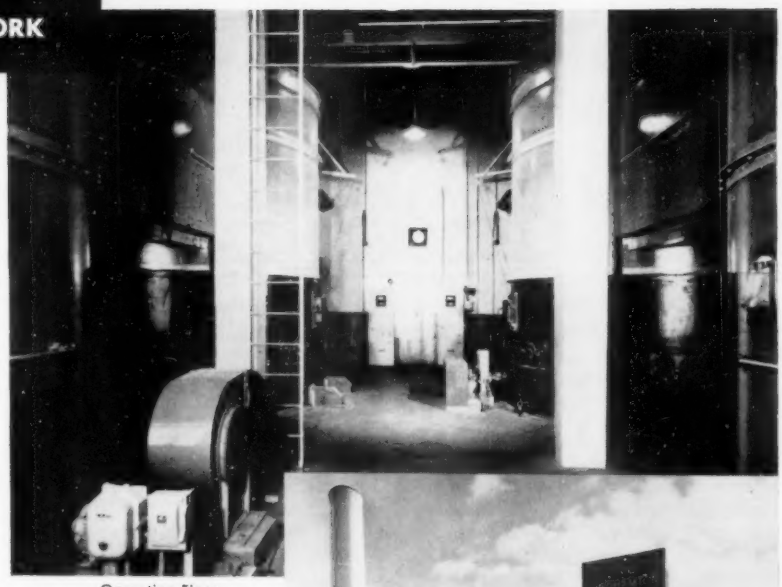

Operating Floor

...and including practical innovations

Incineration Plant, Binghamton, N. Y.

The City of Binghamton, New York, is now operating its new 300 tons per 24 hours Incineration Plant . . . one of several recently completed large municipal plants with the incineration units designed and constructed by Morse Boulger Engineers.

The heart of this plant is the battery of two Morse Boulger units, each with its cylindrical ignition chamber equipped with an Automatic, Continuous, Revolving Stoker, followed by cylindrical combustion chambers. These lead into a common rectangular expansion chamber. One of the innovations is the designation of different parts of the units by distinctive colors. This aids in control, inspection and maintenance.

Note again the use of the automatic and continuously operating stoker *revolving in a cylindrical chamber*. This is the latest improved design for heavy duty stoking. Stoking is more thorough; combustion is better.

For more than 60 years Morse Boulger Engineers have served communities in the very specialized field of refuse and sludge incineration. It's an operation that calls for careful engineering not of just the stoker itself but of the whole unit, including charging, ash removal, heat recovery (when practical) and combustion processes. There can be no susbtitute for experience . . . and it is at Morse Boulger that you will find just such experience.

For details of the Morse Boulger Mechanically Stoked Incinerator with the revolving stoker, write for Bulletin No. 111-C.

MORSE BOULGER DESTRUCTOR CO.

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Representatives in Principal Cities

Major Flooding Problem Solved *through* Joint Citizen-Community Effort

RALPH PERKINS,
Superintendent of Streets, Department of Public Works, Torrance, California

CLOSE cooperation between city government and property owners resulted in the solution of a vexing flood problem at Torrance, Calif., following Southern California's spell of unusually heavy rainfall this year. On March 25, 1958, a group of farmers and residents, led by Fred Kita and Robert Merkel, appeared before the City Council, stated their predicament and requested aid. They explained that the rains arrived and flooded their land at about the time the celery crop should be planted.

The area of some 250 acres has been a natural drainage basin from time immemorial, but never in the past have the growers been faced with this amount of rain at the time the crops were due to be planted.

The City Council was requested to have the city pay up to five thousand dollars for pump and pipe rental, with the growers to furnish the labor for installation of Stang wellpoint type pumps and equipment. It was planned that the water would be carried off in drainage structures, which are too high for gravity drainage of the crop area.

The council immediately appropriated the requested amount, and the details of liability insurance and contracts were worked out quickly. After a continuous effort of 360 hours, an estimated more than 41,040,000 gallons of water were pumped from the affected area at the average rate of 114,000 gallons per hour. In addition to the pumping, much water was taken care of through natural percolation into the ground and by evaporation.

The labor force was stretched thin by the around-the-clock operation, so many of the farmers' wives took their turn operating the pumps to reinforce the workers.

Diversionary ditches were dug by tractor and by hand to channel the water into the first pick-up point. From there it went through a culvert under a main highway, spilled into a second level 35-acre field; then allowed to flow free 1,100 feet to a second pick-up point; and pumped again through pipes to a drainage structure, which is a part of the County control and serves an area to the east of the basin. This was a total distance of about 7,000 feet. There were 2,200 ft. of 10-in. invasion type pipe laid and 3,500 ft. of 12-in. invasion type quick coupled pipe.

Two special 1,000 gallon fuel tanks, utilizing propane type gas were installed to power the 90-hp pumps so that a minimum of time would be needed in refueling.

About half way through the pumping project, a secondary problem arose. A bordering neighborhood, normally relatively safe from storm water, requested the street department to set pumps to lower the water around the homes. There being no other place to discharge the water, it was channeled into the celery growers area. There was approximately 2,000,000 gals. of water pumped from this area.

Hearing that this would prolong pumping and thus delay the celery planting, which brings about $5,000 to $7,000 an acre, the growers responded immediately with complaints to the city fathers, but realizing the homeowners' predicament as being a problem like their own, the growers consented to rehandle the water from the area above their farmland.

This was truly an example of people within a community, faced with a serious problem, turning to their elected officials, presenting their case, and willingly offering their time and money jointly to solve a problem. The "All America" City of Torrance is justly proud of such action and the cemented relationship gained through such cooperative effort. When the area was last observed by the writer, the farmers were busily engaged in planting their celery crop on the dried land.

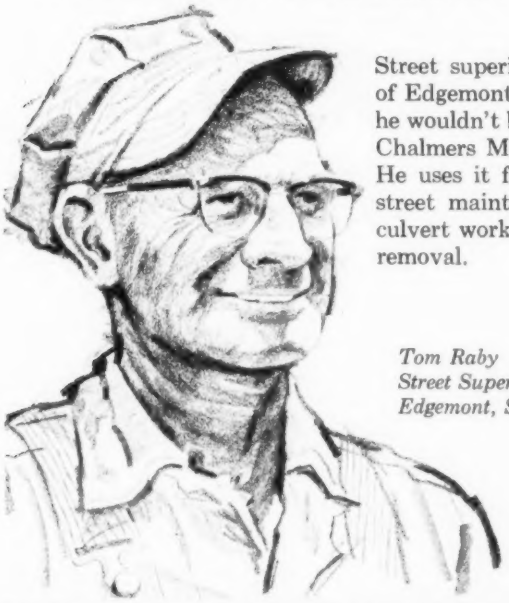
Photos courtesy Long Beach Press Telegram

● **INUNDATED area shown in this air view resulted from unusually heavy rains and created serious problem of drainage.**

● **BLEEDER ditch under construction to complete the drainage program. Author is in foreground; pump sump is at right.**

He's stretching tax dollars

...with an Allis-Chalmers Motor Grader



Street superintendent Tom Raby of Edgemont, South Dakota, says he wouldn't be without their Allis-Chalmers Model D motor grader. He uses it for low-cost road and street maintenance, ditching and culvert work, scarifying and snow removal.

Tom Raby
Street Superintendent
Edgemont, South Dakota

Shown working on the edge of town, Edgemont's Model D is equipped with optional power circle turn and leaning front wheels. Big-grader features like these give greater operating ease, greater work range.

Low-cost Model D maintains up to 15 miles of road per day

Edgemont tax dollars went a long way when they were used for an Allis-Chalmers Model D motor grader. Costing only one-third the price of a large machine, the "D" handles all community grading jobs. It works miles of streets and roads in the area and is also used for ditching to put in new culverts and water mains. Edgemont's Model D has maintained over 31 miles of road in two days—does it three times a month in wet weather.

Versatility combines with economical operation

The "D" is also used effectively on spot assignments. A hydraulic scarifier equips it for ripping old oil surface roads and digging into old culverts. In winter, the "D" scarifies frozen ground on light construction jobs and helps keep snow removal under control with its blade. And for good measure, it maintains the city dump.

Superintendent Raby says his compact Model D does things a big machine can't do—close-quarter grading, easy turning and working around culverts. It has plenty of power, and yet Edgemont gets considerable savings in operating costs. He reports the "D" uses only seven gallons of fuel in eight hours of work.

Ask your Allis-Chalmers construction machinery dealer to show you a "D" in action—50-hp gasoline engine, 8,800 lb. or 50-hp diesel engine, 9,350 lb. You'll like what you see—whether it's grading, maintaining, ripping, loading, removing snow or handling many other applications with attachments including ripper, V-type snowplow, ⅝-cu-yd loader, shoulder maintainer. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Look ahead... *move ahead* ...and stay ahead with **ALLIS-CHALMERS**

Blasting Operations

IT IS obvious that the true cost of a blast is not merely the cost of the explosive consumed, any more than the cost of operating an automobile is the cost of gas and oil alone. Nor do the combined costs of loading and shooting the primary blast show the true cost. Taken alone the cost of the shot itself means little or nothing because it influences and is greatly influenced by other operations. For instance, the cost of the primary blast is influenced by the cost of drilling, since the size and spacing of holes help determine the type and amount of explosives and loading time and effort. In addition, the cost of secondary breakage, the cost of digging, hauling, and even primary crushing is influenced in turn by the efficiency of the primary blast and their costs are thus related to primary blasting cost.

The cost of the primary blast must be analyzed with the costs of other related operations so that the influence of each on the other can be seen. True blasting cost is the total cost of excavation—which includes every operation required to move the rock from its natural state through the primary crusher.

The cost of excavation depends primarily upon the cost of four distinct operations: Drilling; primary blasting; secondary breakage; and digging, hauling and crushing. A fifth category, miscellaneous, allows the inclusion of important cost items which do not logically fall into any of the four operational divisions but which may also affect the cost of blasting operations. The total of these costs is the true cost.

In order to combine the costs of several operations into an overall blasting cost, some common basis of comparison must be established. The usual basis is production—the quantity of material produced. Where the rock or ore itself becomes the product, as in mines and quarries, production is generally stated in tons of rock. Where the material is merely removed, as in construction and strip mining, production is usually expressed in cubic yards of material. Thus, the cost of each operation, and the overall blasting cost, is found in dollars (or cents) per ton or per yard of material produced.

There are several methods of computing the quantity produced: 1) From the volume of solid rock in place before the blast; 2) from the number of loads handled if the rated capacity of digging or hauling equipment is known; and 3) from plant output. The last method is probably the most accurate, but is also the most difficult to compute and applies only to actual processing operations such as quarries and mines.

There are two types of operating costs, direct and indirect. Direct operating costs include labor, supervision, and power or fuel. The major indirect cost is the cost of capital equipment.

If the wage rates and the time spent on the operation are known, the total cost of labor and supervision is easy to compute by simple multiplication.

Materials and supplies are items which are expended or consumed in the operation. Drill bits and blasting caps are two examples. In most cases these costs will be actual expenditures made during the period under consideration. However, the cost of some items, such as drill bits and steel, is probably better computed from an average cost since the actual cost for any individual shot

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Order enough Sterling Rock Salt now so you're fully prepared for unexpected early storms; so you won't run out of rock salt when you need it most. When you have Sterling Rock Salt on hand—ready for use—you help prevent costly business losses, keep traffic moving safely on your streets and highways.

Straight Sterling Rock Salt is a powerful *melting* agent. It helps turn snow into slush—quickly. And when ice forms, salt crystals bore through the ice layer to the road surface. Here, brine is formed and spreads out to break the bond between ice and pavement! Ice can be easily removed—so you get a bare, safe pavement!

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To order your Sterling Rock Salt now, contact your International representative . . . or the sales office nearest you.

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INTERNATIONAL SALT COMPANY, INC.

Gyro-Flo 125 powering an I-R Paving Breaker for street repair work.

The GYRO-FLO 125 Compressor handles the jobs your street crews will tackle . . . faster, more economically

For on-the-job versatility and dependability, you can't beat the Gyro-Flo 125... I-R's 125-cfm rotary portable compressor. Weighing only 2500 pounds ready-to-go with fuel, oil and water, this compact unit compresses ample air power to run the tools most commonly used by your street crews. For example, the Gyro-Flo 125 will operate 3 tampers; or 2 medium Jackhammers; or 2 medium paving breakers.

Like all six models in I-R's Gyro-Flo line, the 125-cfm compressor features Ingersoll-Rand's exclusive Gyro-Flo rotary design. In terms of economical operation and long-term dependability, the Gyro-Flo is recognized as the standard of the industry. And the I-R line of rotary portables is the largest available: capacities of 85, 125, 210, 315, 600 and 900 cfm... the right size portable for any job.

Ask your local Ingersoll-Rand dealer or representative for more information on the Gyro-Flo 125 ... or on any other size Gyro-Flo you may consider suitable for your own jobs. Finish every job faster ... with an Ingersoll-Rand Gyro-Flo and tools from Ingersoll-Rand's complete and time-proven line of air tools and rock drills.

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would be difficult, if not impossible, to determine accurately.

Maintenance and repair costs usually include two major items. The first is labor and the second includes parts and supplies. The latter should take into account such normal maintenance items as lubricating oils and greases as well as replacement spare parts.

In order to compute the cost of a single blast (or the cost over a stated period of time) its costs must be separated from those pertaining to other blasts and other operations. Expenditures for materials and supplies directly involved should be easy to determine. Other costs may be harder to pin down.

Labor costs and the cost of operating equipment can be determined from the time spent working on the shot. Most large operations are surveyed and locations identified by some sort of a grid system. The location of work performed can thus be recorded and assigned to the correct shot. Smaller operations which drill, shoot and dig out only at one or two different locations simultaneously should find it fairly simple to assign labor and equipment costs to an individual shot or period.

Other costs may be much more difficult to assign to a particular blast. However, if the total of these costs is known, they can be prorated and apportioned to the blast by a method similar to that described for pro-rating depreciation.

Many operators keep accurate, up-to-date drilling cost records computed as dollars (or cents) per foot of hole drilled. If this is the case, the calculation of total drilling cost is simple. The total drilling cost is found by multiplying the cost per foot by the total number of feet drilled for the shot.

Labor and supervisory costs of drilling will include such activities as surveying and laying out hole locations, operating and moving the drills, and cleaning the holes after they have been drilled. Operating costs include the cost of power or fuel as well as depreciation of capital equipment.

Primary blasting costs will include the labor and supervision necessary to transport, handle and load the explosives and to perform any other activities required to prepare the blast for firing. In addition, they should include labor required for any clean-up work after the blast. The term clean-up applies to the collection and disposal of empty explosive cases and wrappers as well as to any clean-up of the rock pile which may be required before digging and hauling can commence. In

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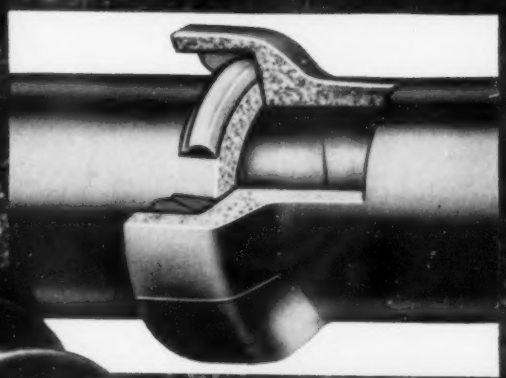
Greatest Contribution to Sanitary Engineering since Vitrified Clay Pipe



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When you want to set high performance standards . . . control infiltration to strict specifications and reducing pumping costs . . . handle root problems . . . insure completion of the job exactly as originally designed . . . maintain lower cost-in-place due to faster, easier installation . . . you'll call for the *best* factory-made joint. Bonded-on Wedge-Lock Joints go in as fast as the trench is dug . . . "snap" tight instantly, in continuous compression . . . last as long as the world's longest lasting pipe.

Always specify *Vitrified Clay Pipe*, with *Wedge-Lock Factory-Made Joints*. Write to listed manufacturers for literature or an actual Wedge-Lock demonstration.

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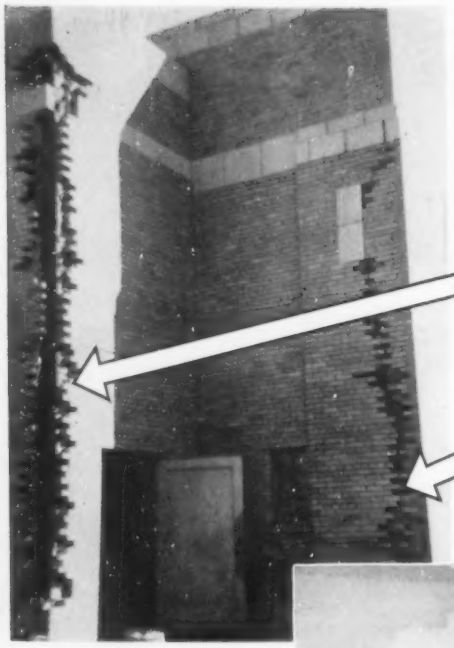
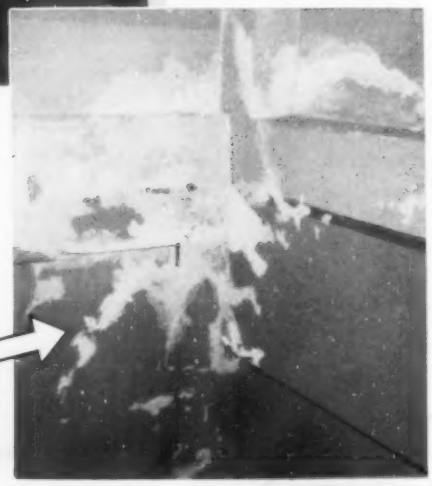


Water almost ruined this building

Costly plaster damage inside of building caused by water seeping through from cracked walls



Water entering through cracks in exterior walls of this expensive brick building caused corrosion of structural columns and beams, making brick walls bulge and crack.

Columns were coated and brick masonry relaid and repointed with DRYJOINT Pointing Mortar and entire building given one coat of THOROCLEAR invisible waterproofing.

Thousands of schools and hospital buildings need THOROCLEAR to keep water out of the masonry walls.

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the event of a misfire, labor will be the major extra cost.

Capital equipment used to make the primary blast will normally be limited to bailing equipment, loading devices and trucks carrying explosives. In most cases this cost will be small but if it can be determined it should be entered to give a true cost picture. Certainly the cost (operation, depreciation and maintenance) of any special handling equipment, for instance that used for preparing ammonium nitrate blasting agents, should be included.

Materials and supplies will probably be the major cost item in any large primary blast. They should include not only the cost of the basic high explosives and or blasting agent (and fuel oil if used) but also the cost of primers, boosters, detonating devices, detonating fuse, electric wires—in short any material which is consumed in the blast.

In the ideal blast the cost of secondary breakage will be zero, but this figure is seldom realized. In terms of total production the cost of secondary breakage should be very low if the primary blast was an efficient one. Nevertheless, in comparison with the amount of actual breakage accomplished, secondary work is always very costly.

If secondary breakage is done by heavy equipment such as a drop-ball crane the major cost items will be labor and equipment depreciation, operation and repair.

If secondary blasting is done the costs will include cost elements similar to those in drilling and primary blasting. Equipment used will normally include compressors and jackhammers, and materials and supplies will include explosives, detonating devices, fuse, etc.

The costs of digging, hauling and crushing are often overlooked, but certainly they cannot be divorced from the other three operations since the quality of the breakage produced by drilling and blasting will greatly influence the maintenance and productivity of digging, hauling and crushing equipment. These costs can be computed in much the same way as drilling costs except that different items of equipment will be involved. They should include the cost of labor and equipment used to move the rock to the primary crusher and the cost of operating and maintaining the primary crusher as well.

This material has been abstracted from the "Blasting Cost Control Manual" published by the Atlas Powder Co. Also available from Atlas is a blasting cost chart which helps the user of explosives to determine his true blasting cost.

New DEMPSTER-DINOSAUR Ends LONG-HAUL Problems

Slash Costs! Get More Than 40 YARDS Per Trip With These Giant "PORTABLE DUMPS"

Up to 40 cubic yards and over . . . up to 30,000 pound loads . . . plus the advantages and economies of detachable containers . . . that's the story behind the all-new DEMPSTER-DINOSAUR. The safe, fool-proof DINOSAUR is a masterpiece of simplicity . . . three simple, piston-type cylinders do the work . . . no cables to attach . . . no sheaves . . . no telescopic cylinders . . . maintenance and operational costs are slashed to the bone! It's the only machine of its type that picks up containers without the driver leaving his cab. The only one that can put containers on a dock.

Big-capacity DEMPSTER-DINOSAUR Containers are "Portable Dumps" — can be used as transfer stations for DEMPSTER-DUMPSTER LFW and GRD installations or conventional trucks. They also provide adequate storage for big-accumulation points such as schools, hospitals, institutions and industrial plants.

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"Payloader" Helps Clear Village Streets

● **THE Village of Shorewood, Wisconsin, puts a rotary plow on its Model HU "Payloader" tractor-shovel when winter snows have to be loaded off downtown streets.**

Sanitary Landfill Operation

(*Continued from page* 117)

deeper than 6 or 8 ins. but should be uniform and provide complete coverage. After the trench is filled, a compacted top cover of 2-ft. thickness should be placed. Also, as a fire break, the face of the slope or ramp should be covered with dirt daily or at intervals not greater than 40 ft.

Eliminating Dumps

Existing dumps can and should be eliminated and the area converted to a sanitary landfill. The procedure is: (1) Eliminate the rat and vermin population to prevent dispersal to neighboring homes or areas; (2) push the existing refuse into windrows; (3) dig a trench or trenches and put in the refuse; (4) compact the refuse in the trench; and (5) cover with fresh earth and compact. The area can be closed or, if space is available, can be converted to a landfill utilizing the most appropriate of the methods already described.

Ravines and Marshes

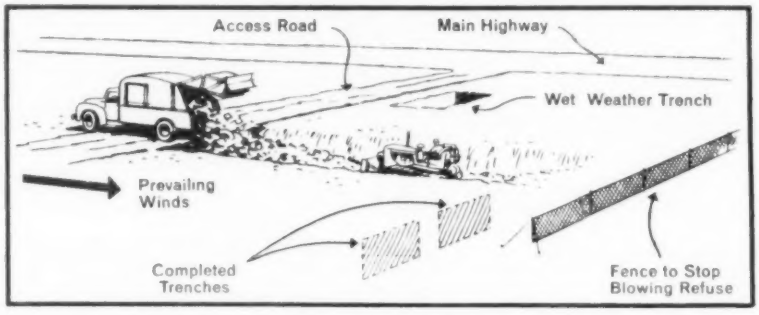
In ravines or similar low areas, the area chosen must not be a waterway and provision must be made for diversion or control of storm water before operations begin.

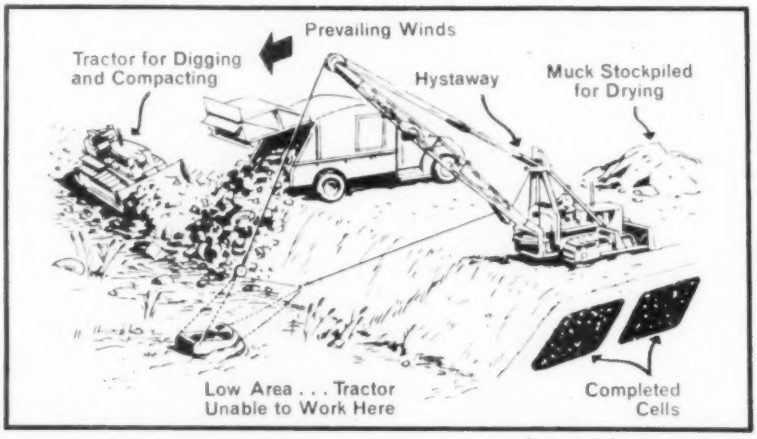
Marsh area operations are feasible. In such cases, trenching must usually be by dragline. It is necessary to construct and maintain a drainage system in keeping with the programmed step-by-step filling operation and adequate to handle both the ground water run-off from adjoining uplands, and the surface run-off from the newly filled plateaus. The discharge end of the ditches should be equipped with readily cleanable trash screens. If discharge is into tidal waters, the coarse screens should be supplemented with flap gates to control back flows. Filling strips should be extended from a previously constructed operating platform. This initial platform, built up from either compacted refuse or other readily available material to a height of about 5 ft. above marsh elevation, facilitates maneuvering of vehicles and generally provides greater flexibility for subsequent operations.

In all of these operations, whether marsh or dry land, it will usually be desirable to have a portion of the fill surface stabilized for wet weather operations. Often, this surfacing can be limited in area and it need be used only when weather conditions interfere with normal operations.

Settlement

Fills should be completed to preplanned grades with due allowances for settlement. Surface grades of 1 to 2 percent are sufficient to help shed rain falls without ponding. Maintenance of uniform grades is essential to eliminate surface pools




Prevailing Winds
Tractor for Digging and Compacting
Hystaway
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Low Area . . . Tractor Unable to Work Here
Completed Cells

Courtesy Caterpillar Tractor Co.

● **DIAGRAMS show sanitary fill operations on flat land and in swampy areas.**

with their potential noisome odors.

Initial shrinkage in dumped refuse volume is produced by compaction from the heavy operating equipment and the weight of the refuse and cover overburden. Subsequent shrinkage develops from filling in of voids left by the rusting of semi-compacted tin cans and the decomposition of the organics. Further subsidence may develop through the compression or shifting of underlying subsoils. The amount of settlement depends on (a) the efficiency of the compaction process; (b) the characteristics of the subsoil; and (c) the depth of the fill. Fills on marshy lands, in bog areas and in ponded or open waters will have considerably greater settlement than fills made on firm soils.

A well constructed fill in good soil should not produce substantial settlement nor odors during the course of the subsequent decomposition of the buried material. A study of sanitary landfill operation in the Oakland, Calif., area by Gerson Chanin, indicated that "it may be concluded that the organic materials are generally almost 98 percent decomposed in one year and virtually completely destroyed (99%+) in two years. However, if cannery wastes are included in the buried materials, then only 50 percent decomposition is obtained in one year and about 96 percent in two years." In most areas, decomposition will be at a slower rate than this, but use can be made of the area for many purposes within two years after completion.

Equipment Used

Adequate equipment is a necessity. The sanitary landfill program should be considered as permanent and tractors, loaders, shovels, draglines and scrapers needed for it should be purchased on a capital investment basis. Machines that are poorly suited for the work or are too small may do more harm than good through inability to win public confidence and support. Bullclam, bulldozer and front end loader units mounted on large tractors are most generally used. On operations involving long haul of cover material and also for certain types of trenching, tractor-drawn scrapers have proved very effective. A study by the Public Health Service showed that even in the smallest communities, the minimum economical size of tractor was 30-40 hp and 4 to 8 tons weight. In larger communities, much heavier units are more economical and effective. The larger tractors will do more work and do it better at a far lower maintenance and operational cost.

The number of units needed depends on the size of the operation. For populations up to about 10,000, a single heavy tractor, with bulldozer, bullclam or front end loader will normally be enough.

Operation

For successful sanitary landfill operations there are two essentials: Dependable equipment and proper supervision. The operation is a day-by-day procedure, the work for each day being largely complete in itself, and any variation from good practice tends to failure. Thus, well trained personnel are essential. In large operations a trained fill supervisor should be in responsible charge, but in a small community, the tractor operator may be the only man at the fill. He will direct the dumping and will spread, compact and cover. Like other responsible personnel in refuse work, he should be a high-grade employee, and he should be fully instructed in the details of the work he is to perform. The State Sanitary Engineer or the representative of the manufacturer of the equipment used can be helpful in preparing a schedule of oper-

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ations based on local conditions. Operations should be the responsibility of a supervisor of sanitation or of the city engineer, who should visit the area frequently.

Dumping of refuse from the collection vehicles should be confined to a narrow dumping face to minimize the need for rehandling and to insure proper compacting of refuse and its cover at the end of the day. In dry areas, and during dry periods, wetting of the refuse will facilitate compaction and reduce dust; and wetting of the soil cover may be needed to obtain proper compaction. If winds tend to scatter pieces of paper a temporary fence (snow fence or chicken wire) may be built to prevent nuisance to adjacent property. Winds may also be considered in the layout, if topography permits and if winds are normally from one direction. In such cases, dumping should be on the windward side of the trench.

When ashes are collected, it may be best to dump these in a separate section of the trench since they may possibly start fires which once started, may be exceedingly difficult to extinguish. However, in a properly constructed sanitary fill, with firebreaks not more than 40 ft. apart, spread of fire is limited. In some cases, ashes are used to stabilize the surface of the fill.

In addition to the access road, the surface of the fill adjacent to the dumping face will be subject to traffic by heavy vehicles. It will need sufficient strength to carry these frequently even in wet weather. Generally if the surface is well compacted and so sloped as to shed rain water, little trouble will be encountered. The surface may be sloped about 1 percent; and for wet weather periods a space half as long as the dry weather dumping face should be treated as necessary to keep it usable.

After completion of the fill, the surface is smoothed and that portion of it which will not be subjected to further heavy traffic can be seeded. During operations, all of the surface, but especially the operating area, should be kept clean. Bottles, pieces of metal or even sharp stones can damage tires. Likewise a bumper should be set in place and anchored to prevent trucks from backing over the dumping edge. A log, a piece of large pipe or 8″ by 8″ or larger timber fastened firmly in place is usually sufficient.

Cold weather operation has been demonstrated to be possible. The trench is dug before freezing weather starts and the earth for the cover is stockpiled. The outside of the pile may freeze but usually enough unfrozen dirt for cover can be reached with heavy tractor equipment. If there are periods when cover is not available, it does not make much difference because there will be no nuisance and no fly production in freezing weather. It is sufficient in very adverse weather to spread and compact the refuse, omitting the cover temporarily.

General Data

A decision must be made wether or not to accept refuse from private haulers and citizens, and also from those living outside the city limits. It is generally better to accept such material because the principal aim is sanitary disposal of the refuse which otherwise may be dumped along roadsides or in other places where it will be a nuisance and a fly producer. The charge to be made, if any, is a matter for local determination. It is best to limit the refuse to material that can be readily handled in the fill without damage to equipment. For instance stumps; tree trunks; useless timber, such as material from a wrecked building;

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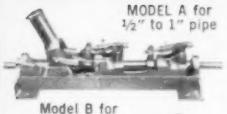

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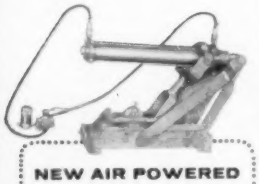

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and semi-solid material are undesirable. The latter which will need special handling since it will not compact, may include sewage sludge dewatered on a vacuum filter.

Dumping must be controlled also to the extent that the hours when wastes will be received from others should be clearly indicated and rigidly adhered to. Such hours should be set so as not to interfere with or delay municipal operations and hold up unloading of municipal vehicles. Dumping must be restricted to the operating face of the fill.

Salvage at the fill should not be permitted as this will often require dumping and rehandling of the refuse, with consequent delay and almost invariably with serious loss of sanitation. However, a few cities report that salvage operations have been possible, with some return from the refuse.

The fill area should be kept neat which will often mean that some provision for picking up loose paper —there will always be a certain amount of this around—should be made. Where the scope of the operations is large enough, there may be an extra man at the fill to direct spotting and discharge of the trucks; and he can be made responsible also for pick-up work.

Conclusion

When sanitary landfills are constructed in accordance with good operating procedures, using equipment of a type and size suited to local conditions and the work to be performed, they have proved to be an economical and effective means for refuse disposal. In addition, they offer a way to develop land which might otherwise be useless and a detriment to the community. However, like every other municipal project, sanitary landfills must be properly planned, well operated and conscientiously supervised if maximum benefits are to be obtained.

• • •

Plumbing Standards of State Building Construction Code

The Plumbing Standards of the State Building Construction Code were promulgated by New York State on Feb. 15, 1958, and will become effective August 15 in those municipalities which use the State Code—32 cities, 81 towns and 136 villages. The New York State Department of Health employs these standards in its latest bulletin on this subject.

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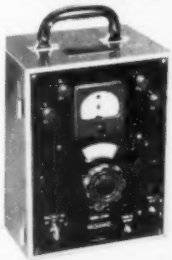

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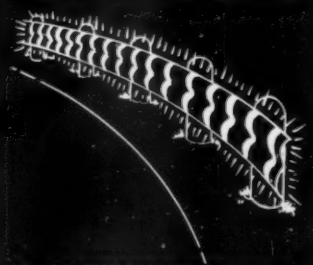

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DESIGNING
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A. H. GENT,
Chief Engineer,
Illinois Inspection Bureau,
Chicago, Illinois

This article is based on a paper presented before the Illinois Section, American Water Works Association, March, 1957.

BY USING the basic elements of forecasting — profiting by the mistakes of the past, taking advantage of knowledge of present resources, and applying those elements to the comprehendible future — planning can be more than an educated guess. We are all familiar with the regional deficiencies in water supply which have caught numerous communities with short supply; but a great many of these situations resulted even when the source was satisfactory and were due definitely to the lack of forethought.

The Illinois Inspection Bureau, representing the fire insurance business, has a very tangible interest in the future of water supply operations. Our interest affects water system customers, just as much as water quantity and quality. In this day and age, with increased prices the usual thing, the continued nominal cost of our commodity and the ability of an insured to obtain proper, full coverage can only be assured through the maintenance of satisfactory preventive and protective facilities.

Until the electronic or other future scientific profession develops a push button operation which will inhibit large scale burning, water will continue its almost universal fire use. Pending this, the Fire Department Instructor's Conference and the National Fire Protection Association are studying better techniques for water use. These studies show possibilities of conservation since one phase involves the development of improved larger capacity water spray application techniques for very short durations. Some use was made of this method in the Malibu Beach brush fire where, even though water was in short supply, of 1540 homes in the area only 84 burned. However, for major municipal operation, the present prescribed duration of fire demand must still hold.

Unnecessary Restrictions

Providing potable water in good quantity through service meters is always primary with waterworks people. The continued ability to sell all the water possible is an advantage because a going concern must operate that way. The worst thing that can happen is the termination or restriction of the supply. Continuity of service must be assured even during periods of maximum demand and this demand must come off the top of the barrel. What is left is the fire protection reserve to provide the volume and the pressure required for public fire protection and to supply private protection facilities such as automatic sprinklers and standpipe systems. With per capita use high and maximum hourly rates increasing, it is easy to see that to conserve the bottom of the barrel for fire safety requires definite forethought.

Fire service requirements are contained in the "Standard Grading Schedule" of the National Board, completely revised in 1956. This publication should be in the library of every man engaged in water supply design. This standard requires delivery of maximum domestic, industrial and fire demand with every portion of the system functioning and also with disruption of a reasonable number of components.

Providing multiple sources of water may be the answer to protecting against periodic regional deficiencies. The use of multiple outlying well stations, discharging directly into the system, in some cases with individual treatment facilities, has also been of value in caring partially for localized deficiencies in distribution characteristics.

The changing character of communities is a factor. Few systems were designed with the possibility of industry and mercantile establishments moving to low-demand outlying areas. For those communities which have industrial ambitions, as many now do, this problem of serving outlying areas becomes foremost.

Automatic Sprinklers

The automatic sprinkler system is the protective device mainly used by industry to assure continuity of operation and to reduce insurance costs. An adequate and reliable public water system is the best source of supply for this facility and industry is constantly looking for locations where such a supply can be made available. Sprinkler systems have an enviable record. Data over more than 50 years show that they have been 96 percent efficient. This efficiency factor is based on fire control with a small number of heads operating. The opening of a large number of sprinklers in a fire area indicates failure and is so recorded.

Water authorities should encourage such installations. Compare the experience in unsprinklered properties, where millions of gallons of water may be needed to establish control, with the comparatively low flow occasioned by the automatic opening of not over ten sprinklers at about 20 gpm each.

Various factors must be watched as the water service problem changes so that the efficiency of sprinkler systems will not be impaired. Among these factors are changes in operating personnel, practices, and procedures; maintenance operations; changes in the location of elevated tanks and pumping stations; changes in consumption by a city as a whole, and in the local area under consideration; and deterioration of pipe capacity, closed gate valves or reduction in capacity of pumps.

Detailed plans and records of operation, source, supply works, distribution and services are not an

extravagance, but as much a necessity as for any going corporation. Instrumentation should be complete, not only for the supply works, but also for the distribution system. Remote recording elevated tank and reservoir level instruments and recording pressure gages in various areas of the system are vital in determining where reinforcement must be accomplished in view of growing demands.

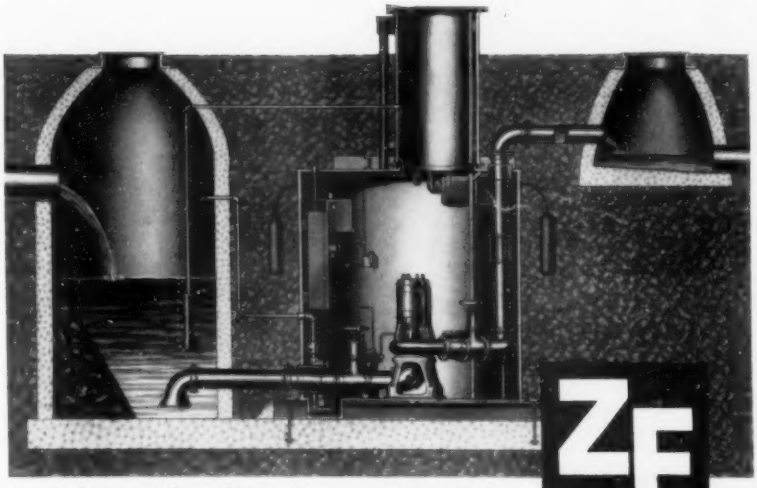
Only where raw water is considered satisfactory for direct use is treatment plant by-passing for enhancing fire demand recommended. Where surface storage is provided in conjunction with the supply works, high lift pumping capacity and supply main capacity should be ample to produce, even with some disruption of service, a rate of flow at least equivalent to the rate of flow through the purification plant or low lift pumping equipment, plus a rate equal to the surface storage capacity divided by the required fire flow duration period. Otherwise a water plant's ability to serve fire flow demand will be limited.

Distribution Storage

In selecting the size of distribution storage, elevated or surface with pumps, maximum hourly demand must be contemplated, so that during such periods a fire reserve will be retained. Where supply works facilities are less than the maximum expected 24-hour demand and experience indicates that demand of this type can occur on successive days, continued dependence on distribution storage to furnish maximum hourly rates will eliminate its value both for fire and for day-by-day consumption purposes. This is also true where the capacity of mains serving a local area in which a storage facility is located is less than the 24-hour maximum use in that area.

Distribution system storage is exceedingly valuable to provide maximum local short duration demands and thereby reduce arterial system pipe sizes, but general system ability to maintain this storage is of prime importance. Where large standpipes are installed and there is little ground elevation advantage, the provision of pumps to utilize the lower portion of the standpipe capacity is recommended.

In industrial, mercantile or institutional areas, the use of a liberal amount of 8-in. pipe for distribution served by looped arteries of larger size is highly recommended. For complete fire and domestic service, 4-inch pipe has no place.



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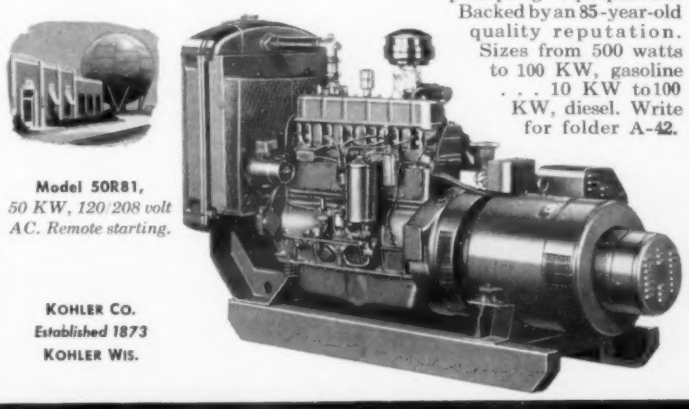

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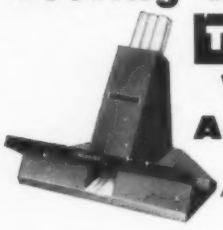

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We should get our existing distribution facilities in proper shape. Surveys for the elimination of closed or inoperative valves; provision of adequate cross connections between arteries and distribution pipe; cleaning pipe and the adoption of treatment to minimize future deposits; and elimination of air pockets at high points should be undertaken. Valve spacing should be investigated so that continuity of service will be assured and no great area will be denied supply because of a line break.

Provision of fire-safe pumping stations, purification plants and waterworks buildings are vital. Fire resistive construction and the arrangement of all facilities in a fire-safe way is necessary.

The reliability of power supply for pumping, purification and general operation cannot be overly stressed. Total elimination of service has occurred too many times in the past, due to lack of proper duplication, to overlook this feature. Electric service should be underground, and duplicated with transformer, control and sectionalized switchboard facilities properly arranged. Otherwise a secondary source of power, such as internal combustion engines, is a necessity.

Hydrant Locations

Future installation of fire hydrants meeting this Association's requirements with liberal flow characteristics at low friction loss and with at least 6-in. connections to distribution mains is urged. The replacement of inadequate fire hydrants of poor design and repair ability will further fire protection. Auxiliary gate valves, preferably on all hydrant connections, and at least on those connected to arteries, will improve continuity of service especially in view of the susceptibility of fire hydrants to automotive injury.

Close fire hydrant spacing along streets in high value industrial, mercantile and public building districts is normal. It is also recognized that multiple fire pumper company response requires numerous connection points close to the property to be protected to deliver the desired fire flow through short hose lines. However, with the modern tendency for large parcels of ground beyond street fronts, the rear of these properties ordinarily require additional consideration. Where hydrants are placed for this rear service, care should be taken that they are located on all weather roads and accessible for the connection of fire department pumper suctions.

In these days of master community plans, both for municipalities and unincorporated county areas, it would seem that, with the plans as guides, water authorities could readily blueprint, at least to some degree, their plans for the future. We all know that change is a constant thing and this blueprint would have to be altered periodically to fit situations as they occurred.

Using Master Plans

It would be a tremendous advantage to water officials if improvements to meet expansion and need for more adequate service could be made on a continuing basis, year by year, following a "master blueprint." The consulting engineering profession has done, and can do, an excellent job along these lines.

Where extensions are placed in newly developed areas, the cost of these extensions should not be borne by the whole tax area but by the new users in the area being developed. If these installations are uncontrolled and unsupervised as to adequacy of design, the system can deteriorate rapidly. Water officials should, therefore, have definite regulations and design standards for these extensions which must be met before permission is granted for service. These should cover service connection facilities, pipe, valves, hydrants, depth of cover, installation practice, pipe sizes, continuity of arterial feeders, etc. Plans should be approved before an installation is started.

We are often asked for our requirements covering the fire protection aspect of systems serving older villages less than 1000 population. In view of characteristics of the older villages and the funds usually available for the initial installation, we normally quote specifications based on the minimum which would be recognized for fire insurance rating purposes. This would include ability to develop at least 500 gpm from supply and storage for a one-hour period in addition to maximum consumption through all portions of the system. In rapidly developing communities, we urge initial design on a materially more liberal basis especially where industrial, shopping center and educational facilities are part of the overall plan. Under such conditions, a fire flow of not less than 1000 gpm for at least 4 hours duration would be recommended. In addition, thought toward later supply works and distribution system expansion is urged.

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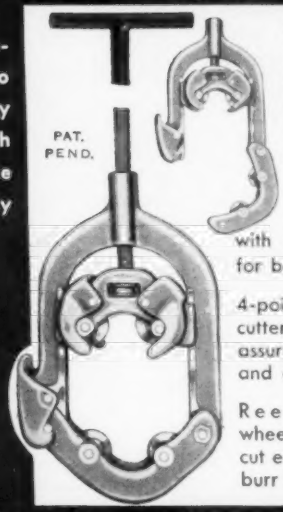

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MILTON HUSTON,
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The standard patching procedure is simple. First, we prepare the break in the pavement by cutting it out and shaping it up with an air hammer. If there is base failure, it is repaired and/or replaced at this time. The hole is then surfaced with hot mix and compacted with a 6 to 8-ton tandem roller.

Hot Mix for Patches

Since we desire to use hot mix, we had a problem of obtaining this type of patching material. The closest hot mix asphalt plant is owned and operated by a road contractor and is located some distance from Olathe. This source of supply had a tendency to be unreliable because of the distance involved and the unavoidable delays at the plant. Sometimes there would be a two to three-hour wait, which meant that we could not utilize our personnel and equipment to advantage. We considered seriously the purchase of our own asphalt plant. We did not desire a large stationary plant, as the construction and paving work can be done efficiently by any one of the several excellent and well qualified contractors in the area.

What we needed was a small, inexpensive, portable asphalt plant that would not require auxiliary equipment to operate; would produce hot mix in sufficient quantities to handle patching and small paving jobs; and that could be used at any time of the year. We were fortunate in locating such a plant in the Wylie Mfg. Co. "Patchmobile." It fitted into our program from the standpoint of both cost and capacity.

The Patchmobile produces up to 8 tons per hour of hot mix. The portability of this unit is a great asset, but if need be, we can set it up as a central plant. It has its own individual rotary dryer for rock and sand; a 165-gallon asphalt storage capacity with additional 55-gallon auxiliary storage; an asphalt metering system; a pugmill; a hand spray hose for tacking; and gasoline engine power. The machine is equipped with propane heat, but we could have had kerosene burners. In short, we have in our machine a completely self-contained portable asphalt plant. We are now operating this unit for the second season and, surprising as it may seem, our maintenance cost on the unit has been absolutely nothing.

From stockpile, we load a dump truck with crusher run aggregate of ½-in. limestone down, and sand. The Patchmobile which has been charged with bitumen is then attached to the truck and the patching crew is ready to go. At the jobsite, the crew of four men work as follows: One man is in the truck charging the dryer hopper with a mixture of three parts crusher run aggregate to one part sand, the proportions developed by experience; one man operates the machine; and two men shape and compact the hot mix in the holes to be patched.

Material Cost Reduced

This plant has reduced the cost of hot mix to around $4.25 per ton. But, more important to us, it gives an immediate source of supply of the type of high grade patching material we have found best suited for long life, thus enabling the City to obtain maximum utilization of the patching crew. We can place approximately 20 tons of hot mix per day in patches ranging from small to medium.

To patch in Olathe, it is simply a matter of firing up the Patchmobile, winter or summer, spring or fall, regardless of temperature.

● **DUMP TRUCK is loaded with aggregate and portable asphalt plant is attached. Crew of four men charges the mixer, operates it and spreads and compacts surfacing.**

Mapping A Highway 3,000 Miles Away

In Syosset, N. Y., engineers of the firm of Lockwood, Kessler & Bartlett, Inc., are carefully mapping a road that will join two cities in Colombia, South America. It will traverse rugged, remote, mountain terrain still in the pack mule era insofar as direct overland travel is concerned.

The proposed new road will run southeast from the major industrial center of Medellin to La Dorada, a port city on the Magdalena River. There it will connect with another projected road to Bogota, giving Medellin and its 400,000 people their first direct overland link with the nation's capital.

The countryside is sparsely settled, desolate and virtually unmapped for engineering purposes. The firm's first task was to create the necessary maps.

Lockwood, Kessler & Bartlett's photogrammetry crew spent several weeks on the Medellin-La Dorada mission. They had to wait for good weather and cloudless skies to get the best results.

At Syosset, aerial photography experts matched up dozens of pictures and mounted them on a long board. When they were finished, they had a complete and to-scale view of every hill, valley, stream, nook and crevice in the 90 miles between Medellin and La Dorada. Also at Syosset stereoplotters were used to construct accurate topographical maps.

With the photos and maps the engineers can then lay out their highway. They can tell, for example, whether or not to deflect the road a few miles to take advantage of a natural grade or mountain pass, or where it will be most feasible to bridge a stream. Even more important, they can weigh the advantages of alternate routes. Photogrammetry gives the answer, practically at a glance. A digital computer turns out in minutes answers that used to take weeks and months to calculate. The computer is a major factor in keeping construction costs to a minimum.

Other electronic devices are used for modern road engineering. One is a tellurometer. By means of radar-like signals, this equipment gives the actual ground distances more accurately and much faster than conventional tape measurements. An airborne profile recorder works on a similar principle. Used in conjunction with the aerial camera it maps the actual profile of the ground below.

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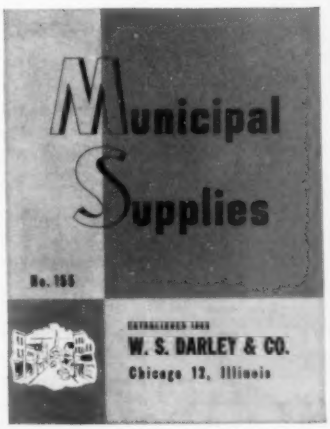

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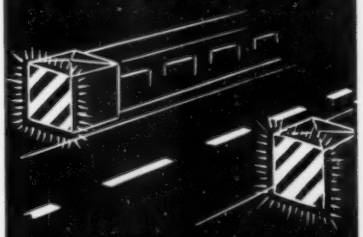

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IHC Demonstrates Wheel Tractors

THE INTERNATIONAL Harvester Co., on July 18, exhibited more than $2,000,000 worth of equipment at their Hinsdale Experimental Farm. The show was held under a total spread of 80,000 sq. ft. of canvas.

The farm is a 412-acre tract of land used for experimenting, testing and developing new and better farm tractors. A multi-million dollar Farm Equipment Research and Engineering Center, with approximately 450,000 sq. ft. of floor space, is scheduled for completion next spring.

Shown for the first time was a new line of commercial wheel tractors in six power sizes with virtually an unlimited number of models. The tractors range in size from 12.8 estimated hp for the Cub Lo-Boy to 72 ehp for the International 560 tractor. Next in line after the Cub Lo-Boy is the light-duty 140 tractor, with 28 ehp, available with either gasoline or distillate engine. The International 240, 28 dhp and 38 ehp, and the 340 Utility, 32 dhp and 45 ehp, are available with a choice of gasoline, LP gas, or distillate engines. The 460 Utility, with 45 dhp and 61 ehp, and the 560, 54 dhp and 72 ehp, are equipped with multi-range, six-cylinder gasoline, LP gas, distillate or diesel engines.

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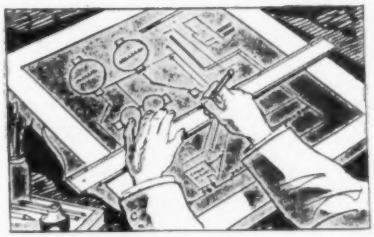

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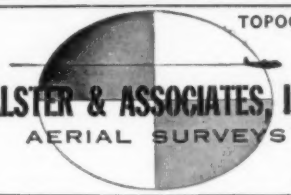

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Standby power has been provided by Trenton, Mich., to insure the continued operation of electric storm water pumps under all emergency conditions. The need for such power arises from local terrain features in the eastern area of Trenton. Facing the Detroit River, the area is mostly flat with a lack of natural drainage to the river. Heavy clays comprise much of the subsoil, limiting any great amount of absorption by the ground. Lift stations are vital during storms to remove runoff promptly to outlets on the river. To meet these needs, the city purchased a portable generator set capable of meeting the emergency requirements of any one of the four lift stations comprising the system. The unit makes Trenton one of the few Michigan cities prepared with this type of equipment.

The specially designed set, mounted on a two-wheel trailer, consists of a four cylinder General Motors Diesel engine driving an 80-KW generator (75-KVA; 60-cycle; 208/-240 volts). When hooked up to Trenton's main pumping station, it will supply power to pump 17,000 to 20,000 gallons of storm water per minute. Demands would normally reach this level only during and immediately following severe rainstorms.

Recent tests demonstrated the speed and simplicity of use when mainline power interruptions occur. First, the unit is towed to the emergency point by any vehicle of ¾-ton capacity or over. On location it is connected to the "load" by two lead cables fitted with quick-fastening plugs. Since the engine has push-button starting and needs no warm-up period, power can be generated the instant cables are connected and a two-way switch within the pumping station is thrown from main line to standby power. Conveniently placed receptacles at all of the four stations reduce connecting time.

• • •

Make Sure of Your Ground When Arc Welding

The flashing blue light and crackling sounds made by an arc welder are familiar signs of maintenance work. But this important tool can become a damaging force without a good ground. Here's what can happen. During arc welding a heavy electric current passes from the arc welding generator through cables to the metal being welded. It then jumps across a gap, melts the metal

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electrode and returns to the generator. The path of the electric current traveling from the ground clamp through a tractor, engine or other piece of equipment to the point where the arc occurs is of the greatest importance.

According to the Service Department of Caterpillar Tractor Co., an arc is likely to occur wherever a gap interrupts the flow of current. The heavy welding current may also break up and take numerous paths through a machine on which the welding is being performed. Should the current encounter an air gap across a bearing in an engine, it is possible for welding to take place right there. Although fusion of the two pieces may not take place, weld blotches on a bearing or gear can cause an early failure of the part.

The paths taken by the return current to a welding generator are unpredictable. The only certain thing about electric current is that it will travel the route of least resistance. For this reason it's best to fasten a ground clamp directly to the piece being welded. If this is impractical, take extra care to clean off rust, paint or oil to give the return current the least chance of going astray.

• • •

City-Industry Cooperation for Adequate Water Supply

(*Continued from page* 101)

from Panther Creek to Cavalero's Corner.

5) Installation of approx. 15,000 feet of 48-in. transmission line from Cavalero's Corner across the Snohomish River flats to Cedar and Pacific Streets in Everett. Approximately 8800 feet of trestle is used to support the pipe over unstable ground in this section. There is also involved in this section some 900 feet of submarine river crossings at the Snohomish River and Ebey Slough.

6) Installation of approximately 13,000 feet of 48-in. pipe through the city to the termination of the transmission line at the reservoirs.

7) Repair of approximately 8200 feet of timber trestle supporting existing transmission lines over the Snohomish River flats.

8) Cement-mortar-lining of approximately 6700 feet of 48-in. diameter welded steel transmission line No. 2 along the section just east of the trestle where soil conditions are highly corrosive.

The order in which the contracts are being let is such that the most critical parts are taken care of first. The new section of the No. 4 proj-

ect between Cavalero's Corner and Cedar street is being installed first. On completion of this the existing No. 2 line will be connected with the new line at each end of the section installed. This will allow the trestle repair and pipe-lining work to proceed while the water flow from No. 2 line is diverted to No. 4 line. Next section to be installed will be from Portal 4 to the screenhouse. The next two sections will be from the screenhouse to Cavalero's Corner and from Cedar and Pacific across the city to the reservoirs. All of this work is overlapping and coordinated so that there will be no interruption in service.

It is anticipated that the work on the entire project will be completed by the first part of 1959. Contracts let to date include the pile trestle installation award to Hart Construction Co. of Tacoma, $205,645; furnishing steel pipe and fittings, Beall Pipe and Tank Corp., Portland, Ore., $456,530, delivery of which has been completed; installation of steel pipe under item No. 5, Alton V. Phillips Co., Seattle, $181,742. All of these contracts have been less than the consulting engineer's estimates, and all construction is proceeding on schedule.

Thus a problem which could have aroused a great deal of controversy from both sides was solved by those involved sitting down and striving to achieve an understanding which was mutually profitable to all concerned. The amicable solution of this problem proves that industry and domestic users can support a city water system within the limit of both their financial abilities, with neither group being imposed upon by the other.

Such cooperation has given Everett a City Water Department which supplies some twenty water districts, ranging in size from 10 to 10,000 customers, at a book value today of over $10,000,000 but which could not be duplicated at today's prices for four times that amount.

• • •

Pre-Civil War Water Main Serves Washington

Back in 1858, a cast iron water main 8½ miles long was built from the Georgetown Reservoir in Washington, D. C., to the Navy Yard. Engineer in charge was Capt. Montgomery Meigs, later Quartermaster General for the Federal armies. A recent excavation to install a new valve in this old line showed it to be in excellent condition after a continuous service for 100 years.

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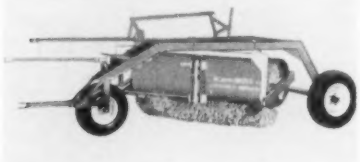
Wachs Pipe Coupler For Pressure Joint Pipe

The Wachs pipe coupler is a new single unit pipe coupling machine for cement-asbestos, concrete, clay or cast iron pressure joint pipe. The new compound leverage coupler saves time as well as labor and pulls the pipe all the way home for a bottle tight, positive seal. The unit sits on top of pipe and is clamped in position with a single action lever. No chains, cables or pulleys—nothing to pass under pipe. The couplers are furnished in 6 sizes, from 6 to 16 ins. Write E. H. Wachs Co., 1527 North Dayton St., Chicago 22, Ill., or circle **No. 9-1** on the reply card.

Coupler saves time as well as labor

All-Purpose Street Sweeper

The Carson Street-King, an all-purpose sweeper that can be used with any make or size tractor, truck or jeep with power take-off, is announced by Carson Mfg. Co. Of all-steel construction, the sweeper is attached by a simple pin and drawbar connection. With it, fast and easy hookup and detaching are assured. The broom is mounted on a 35° angle with the front wheel axle and sweeps a path 5½ feet wide. It can be floated or manually raised and lowered in motion for different sweeping levels. The wooden brush core comes filled with either palm or steel fiber and can be reversed end for end for even wear. Tires and tubes are standard equipment. It sweeps alleys, streets, airport runways, and parking lots, and can be used in street construction and asphalt paving preparation. Additional information is available from Carson Mfg. Co., P. O. Box 256, Maryville, Mo., or circle **No. 9-2** on the reply card.



Sweeper can be used with any make or size tractor, truck or jeep with PTO

Automatic 3-Point Grip Wrench

The One-Hander wrench, a self-adjusting automatic 3-point grip wrench offers the advantage of a ratching action which makes tedious resetting of the jaw unnecessary. The wrench is available in sizes from 6 to 36 ins. The 15-in. as well as the 20-in. pipe wrench is especially recommended where work inside water meter boxes present a problem. The wrench will tighten as well as disconnect mains without removal of the box. Thin jaw chrome wrenches for close-nipple work are also available. For further information write to BeeVel Products, 2249 Federal Ave., Los Angeles 64, Calif., or circle **No. 9-3** on the reply card.

Wrench used inside water meter boxes

Radio Control Systems

The Perma-Power remote signal systems are designed to fulfill the requirements of low cost, medium range radio remote control. Actually a radio controlled switch, this system consists of transmitter, receiver, antennae and mounting hardware. It may be used to control any electrical device and can eliminate the use of wires, phone lines, or cables wherever they are difficult or impossible to install and costly to maintain. Typical applications include entrance gates, remote lighting, approach warnings, pumps and machinery and airport runway lights. Operating distances from a few feet to over one mile (using fixed, roofmounted transmitting antenna) can be provided. Transmitters or receivers are available for operation from 115-volt AC, for fixed station controls, or from 6 or 12-volt DC storage batteries for mobile control. Further information from Perma-Power Co., 3100 N. Elston Ave., Chicago, Ill., or circle **No. 9-4** on the reply card.

Pipe Cutter for Tile, Transite or Duriron

A new type of cutter for standard or extra-heavy soil pipe, field tile, vitreous tile, asbestos cement and Duriron has been announced by Wheeler Mfg. Co. The cutter is easily used by one man, requires no vise or turning. Operator wraps the chain around the pipe, pulls the handle, and cleanly cuts pipe 2 ins. through 4 ins. By adding an extra chain, operator can cut 6-in. extra-heavy soil pipe or 15-in. tile. It takes only 10 seconds to operate, cuts cleanly without breakage, can cut slices as narrow as ¾-in., and is easy to use in close quarters or blind spots. For more information write Wheeler Mfg. Co., Ross Road, Ashtabula, Ohio, or circle **No. 9-5** on the reply card.

Cutter takes only 10 seconds to operate and cuts cleanly without breakage

Unit Brings Water Meter Reading Out in the Open

A water meter register that brings meter reading out in the open has been developed by Badger Meter Mfg. Co. The device is called Read-o-Matic, and its most unique aspect is the fact that the register can be placed as far as one-half mile away from the meter and still accurately record the flow of water (or any other fluid) through the meter. Simple to install, the outside register needs only a doorbell type wire as

Simple to install, register is fastened to the meter with doorbell-type wire

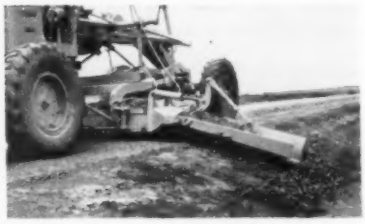
a connection to the meter. The extremely low voltage of the self-powered register permits safe unrestricted installation. No outside power source is required. This wire carries the impulses from a small self-contained generator atop the meter to the register outside the home. The register remains a permanent part of the installation, even if the meter requires repair or replacement. The Read-o-Matic also will make possible a centralized meter-reading station for residential use which would enable a meter reader to cover an entire neighborhood quickly and efficiently, stopping only at corner reading stations to read up to scores of meters at one time. Further information is available from Badger Meter Mfg. Co., 4545 West Brown Deer Road, Milwaukee 18, Wisc., or circle **No. 9-6** on the reply card.

Efficiency Recorder Indicates Productive and Down Time

This efficiency recorder announced by Gorrell & Gorrell, is a new tool for management, engineers and operators. With simplicity and accuracy, the chart shows the "on" or productive time as well as the idle or "down time." The recorder is continuously readable for every instant in percentage of time over the entire shift, be it 8 hours or 31 days. During productive time, the graphic line climbs upward at an angle. During idle time, the line instantly becomes horizontal. The inkless chart 6 x 14 ins. is placed on a continuously aluminum rotating drum. The drum is driven by a precise constant speed electric motor of electric clock accuracy. For more data write Gorrell & Gorrell, Westwood, N.J., or circle **No. 9-7** on the reply card.

Motor Grader Moldboard Attachment

A motor grader moldboard attachment, the hydraulically-operated Bee-Line finisher, has been announced by Hasselbalch and Sons. The attachment works as a natural, adjustable extension to the moldboard, and is said to reduce finishing time substantially. With the Bee-Line angled down, you can brush the top of the grade and strike the shoulder line clean and fast, in

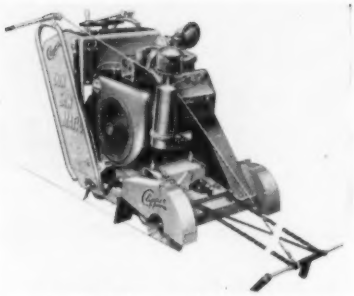


Finisher cleans excess material from the base of the back and fore slopes

one pass. It extends moldboard reach for cutting farther up those long back slopes. With the Bee-Line angled up, one pass of the motor grader cleans excess material from the base of back and fore slopes, and sets the toe-line of the slope. It is accurately controlled from the operator's platform. The attachment is available for all Caterpillar No. 12's back to 9K 2912, plus Adams models 660, 550, 440 and 330. For more data write Hasselbalch & Sons, 1112 Capital, Omaha, Nebr., or circle **No. 9-8** on the reply card.

Concrete Saw

The Clipper Mfg. Co. announces a new concrete saw Model C-300. Strongly constructed and highly maneuverable it is designed for patching and trenching, and for heavy duty maintenance work. Contraction joints in new runways and taxiways, in city streets and highway paving projects can be sawed quickly and economically. Trenches for sewers, water and gas lines can be sawed easily. It is ideal for asphalt

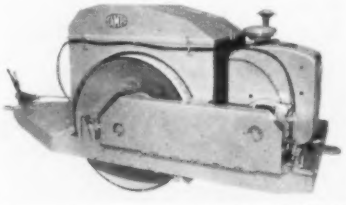


Saw is ideal for patching and trenching and for heavy-duty maintenance

paving jobs where it is desirable to saw at the end of a day's run or when it's necessary to make cuts at intersections where new asphalt ties into existing streets. The C-300 saws up to 22 fpm. It features a clutch type water pump that eliminates the necessity of disconnecting the water pump belt when running the saw dry, or when idling for extended periods of time. The 3 point no-bind blade suspension, with four wheels and pivoting front axle keeps the blade straight and true in the cut, even on rough, irregular surfaces. For more details write Clipper Mfg. Co., Suite 226, 2800 Warwick, Kansas City, Mo., or circle **No. 9-9** on the reply card.

Tow-Type Vibratory Roller

Specifications for Tampo's new Model C-40 tow-type roller include several innovations which add to the effectiveness of vibratory compaction. One important feature is the combination pneumatic and rubber shock mounting which isolates roller frame and tractor from vibratory shock, resulting in smoother performance and preventing damage to frame and couplings. Vibration frequency is variable by throttle setting and remotely controlled from operator seat position. Compacting power ranges from an impressive 30 to 40 tons with a gross weight of only seven tons. More details from Tampo Mfg. Co., Box 2340, San Antonio, Tex., or circle **No. 9-10** on the reply card.



Compacting power ranges from 30 to 40 tons but the roller weighs only 7 tons

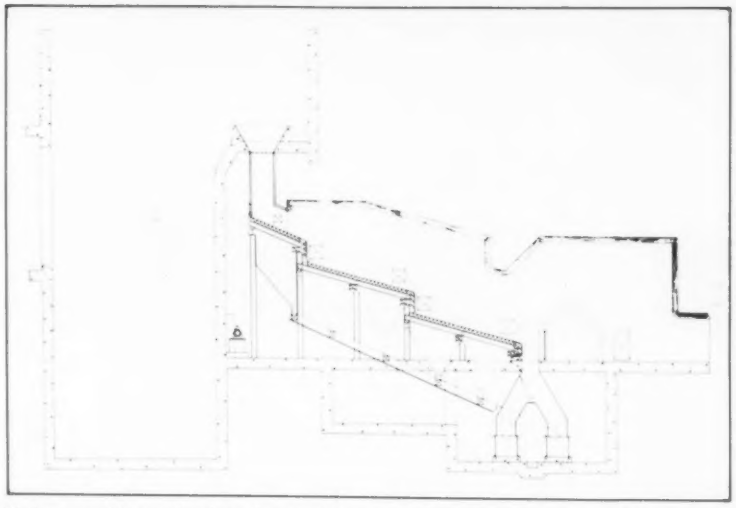
Reflective Glass Sign Bead

A new reflective glass bead, designated as UB68, for application to backgrounds of thruway signs, has been introduced by Flex-O-Lite. An ultra bright bead in the medium index classification, the product is particularly recommended for use on signs in the darker pigmented colors such as greens, blues and reds. The bead is said to assure impressive reflectivity under all weather conditions, and to offer maximum possible angularity up to the point of passing. Chemical stability and long life as well as ease of application, and a minimum of maintenance qualifies it for large reflectorized overhead signs, distance and destination signs, red stop signs and other applications. For further information write Flex-O-Lite Mfg. Corp., 8301 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.), St. Louis 23, Mo., or circle **No. 9-11** on the reply card.

Highway Flasher Light Standard

Pacific Mercury is introducing a highway standard, the Model S-1000, for use with both its neon and transistorized flasher lights. The standard has a heavy steel base to prevent tipping and a specially designed hood to give excellent daylight visibility to the Pacific Mercury warning lights. To thwart theft, the warning light locks onto the standard. Designed for use on construction projects, road or street hazards or for use as an in-plant warning signal, the unit occupies very little space. For details write Pacific Mercury, 14052 Burbank Blvd., Van Nuys, Calif., or circle **No. 9-12** on the reply card.

Constant-Flo Incinerator Stoker



Stoker provides reduction of operating personnel and higher rates of destruction

Through automatic operation with electronic controls, the Flynn & Emrich Constant-Flo incinerator stoker combines progressive burning with controlled, constant flow of material through the furnace, continuous agitation, break up and turn over and controlled residue disposal. The unit permits reduction of plant operating personnel, higher rates of destruction with less air pollution and controlled furnace temperatures with much lower furnace maintenance. For complete details write Flynn & Emrich Co., 301 North Holliday St., Baltimore 2, Maryland, or circle **No. 9-14** on the reply card today.

Manhole Pipe Stub

An asbestos-cement manhole pipe stub announced by Keasbey & Mattison is 2 ft. in length. The stub is incorporated into the structure of the manhole at the time it is built providing for easy access to the manhole for future sewer extensions. The new fitting is machined on one end to receive the K & M Fluid-Tite coupling or for connection with other sewer materials, while the unmachined end is placed in the wall of the manhole. While not in use, the machined end of the stub, lying outside the manhole, is covered with an asbestos-cement end-cap. It is available in all popular diameters. Write Keasbey & Mattison Co., Ambler, Pa., or circle **No. 9-13** on the reply card.

Towed-Type Spreader

A completely new, more-rugged and easier-to-use version of the Odell towed-type spreader has been announced by Good Roads Machinery. Designed for aggregate or asphalt spreading from feather-edge to 8-in. depth, the new Odell provides fast, smooth and accurate spreading. A new floating strike-off bar is completely independent of the hopper, and accurately controls spread depth. Spread is adjustable from 1 to 10-ft. widths and adjustment of one bolt permits level spread or up to 1½-in. crown or reverse crown. A universal truck hitch, for practically any dump or semi-dump truck, is quickly attached and readily adjusts to different sizes and types without special attachments. Other features include a lower, wider, more-rugged hopper; an improved operator's platform; and wide steel front rollers to support the hopper box. Write Good Roads Machinery Corp., Minerva, Ohio, or circle **No. 9-15** on the reply card.

Spreader is carried on truck tail gate

Ottawa Backhoe For 104 & 154 Trojan Tractors

Excavation, pipelaying, backfilling and compacting can be accomplished by one unit

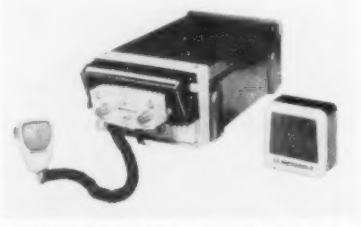
To meet the economy needs of contractors and highway engineers for equipment capable of multi-purpose operations, Trojan has adapted the Ottawa Model LX backhoe for use on two models of its tractor shovel line, the 1¼-yard Model 104 and the 2-yard Model 154. With the Ottawa Model LX backhoe, the Trojan tractor shovels can handle drainage operations from start to finish. The excavation, pipelaying, backfilling and compacting can be accomplished speedily and efficiently with one Trojan tractor shovel. This backhoe-loader combination is also capable of excavating for foundations, and loading the material into dump trucks for stockpiling it for future backfilling operations. The standard bucket comes in widths of 18, 24, and 30 inches. The special ejector bucket that automatically forces wet, sticky material from the bucket has widths of 14, 18 and 24 inches. The Grave-Bellhole bucket, for digging straight sides and square corners, comes in four sizes, 18, 24, 30, and 36 inches. For further information on this equipment write to the Trojan Division of The Yale & Towne Mfg. Co., Batavia, N. Y., or circle **No. 9-17** on the reply card.

Housing For Fluorescent Street Light

A housing for fluorescent street lights, announced by the Molded Fiber Glass Co., is designed for the Westinghouse Mainstreeter fluorescent luminaire. The part, which forms a protective cover and support for reflector, lamps and refractor, is said to be completely weather resistant and unaffected by temperature changes. Color is molded in, and painting is not necessary. It is lightweight and easy to mount, yet strong and resistant to mechanical damage and is molded in one piece. Write for information to Molded Fiber Glass Co., 4401 Benefit Ave., Ashtabula, O., or circle **No. 9-16** on the reply card.

Motorola Announces 450-470 MC. "T-Power" Radiophone

Motorola has announced a new mobile 2-way radiophone operating in the 450-470 MC. frequency band. Featuring a transistorized power supply and an advanced unified chassis design, the new unit provides greater reliability and operational benefits. The equipment utilizes transistors in the power supply rather than the traditional mechanical vibrators and so fills out the Motorola "T-Power" radio line. The unit weighs 34 lbs. and is packaged in a narrower 10-in. housing, enabling both under-dash and trunk mounting. The radiophone provides 18 watt transmitter power output and a new high of 3 watt receiver output. It operates from a 12-volt electrical system, positive or negative ground. For more information write to Motorola Communications & Electronics, Inc., 4501 West Augusta Blvd., Chicago 51, Ill., or circle **No. 9-18** on the reply card.



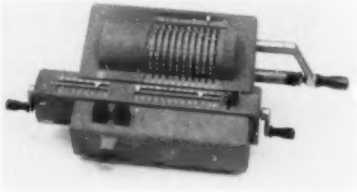
Equipment utilizes transistors in the power supply rather than the vibrators

High Visibility Yellow Rainwear

A new line of rainwear is announced by Industrial Products Co. Offered in two materials, cotton or nylon base, the rainwear is coated with high-visibility yellow neoprene. It is made in a full assortment of styles, jackets, pants, three-quarter and full length coats, hoods and hats. Full cut for wear over regular clothing, it may be laundered, scrubbed with soap and water or dry-cleaned. Full information from Industrial Products Co., 2714 N. Fourth St., Philadelphia 33, Pa., or circle **No. 9-19** on the reply card.

Hand-Operated Odhner Calculator

Designed specifically for simplicity and ease of operation, the compact, hand-operated machine, Model 227 announced by Facit, Inc., performs all calculating functions, from the simplest to the most complicated, such as simultaneous multiplication and square roots. Outstanding feature of the machine is a back transfer time saving device, which makes it possible to perform repeated (chain) multiplications, such as simple and complex dis-



Calculator for practicing engineers

counting calculations. Equipped with a 10-lever setting board, 12-digit result register and 8-digit proof register, the calculator is geared for efficient hand operation. It has a base area of 7½ ins. by 6 ins. and weighs 12½ pounds. Further information may be obtained from Facit, Inc., 404 Fourth Ave., New York 16, N. Y., or circle **No. 9-20** on the reply card.

Cast Iron Parshall Flume

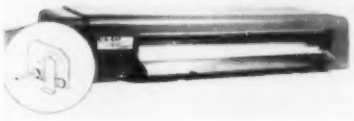
The Burgess-Manning cast iron Parshall flume is an integral unit that can be placed in position in a single operation. The ample wall thickness and sturdy reinforcing ribs of the casting prevent distortion, buckle, warp or twist. The flumes are made in throat sizes of 3, 6, 9, 12 and 18 ins. For more information write Burgess-Manning Co., Penn Instruments Div., 4110 Haverford Ave., Philadelphia 4, Pa., or circle **No. 9-21** on the reply card.

Electric Plant of 100 kw Capacity

Kohler Co. has added to its line of electric plants a water cooled plant of 100 kw capacity. Listed as Model 100C74, 100-kw, 240/480-volt, AC, three-phase, these new plants are available with either city water or radiator cooling and for gasoline or city gas. For additional information write to Engine and Electric Plant Sales Department, Kohler Co., Kohler, Wisc., or circle **No. 9-22** on the reply card.

White-Printer For Engineers and Draftsmen

Differing from photocopy processes, the white-printer utilizes as an original anything drawn, written



Unit assures wrinkle-free copies of engineering drawings, maps and charts

or typed on translucent paper to make black or blue-line copies on to sensitized diazo paper. Through a new system which drives both lower rollers by means of a belt and pulley drive, plus longer belts for reduced tension, the new Blu-Ray now offers a much improved method of paper feeding. This permits the processing of material of any width up to 42 ins. with no tendency whatever to crease or wrinkle either the original or its copies. The machine, which requires no venting, offers the advantages of dry development by the aqua-ammonia vapor process, producing clean, legible copies within seconds. Complete information from Blu-Ray, Dept. DR, 301 Main St., Ivoryton, Conn., or circle **No. 9-23** on the reply card.

Lull Mortar Cart Has Wheel Brakes

The Lull Engineering Co. announces production of a 7-cu. ft. mortar cart. An all-welded steel-plate tank has a ratchet on the lip for engaging the wheel brakes. Rear wheels are full caster-type, steering-tires are semi-pneumatic to roll over small objects and litter on scaffold. Durable construction features full-width end bracing of the wheel support plate by a return bend welded to the tank body. For complete information write Lull Engineering Co., 3045 Highway 13, St. Paul, Minn., or circle **No. 9-24** on the reply card.

Automatic Equipment For Off-Street Parking

Magee-Hale Park-O-Meter Co. adds Park-O-Gate and Ticket Spitter to its line of mechanical equipment for automatic parking control. User "self-parking" is becoming more universally used for both private and municipal off-street parking facilities. This is because no parking lot attendant is necessary, thereby reducing operating costs, and because of its greater user convenience, and risk avoidance. The Park-O-Gate handles special situations more economically controlled at entry with actuation by coins, key, or key-card. Also, the automatic gates may be advantageously used in combination with the Ticket-Spitter for facilities large enough to use one full time attendant. For more details write Magee-Hale Park-O-Meter Co., Oklahoma City, Okla., or circle **No. 9-25** on the reply card.

Mobile Field Office

The job-site office, announced by Wheaton National Sales, is maintenance-free, fire-safe and theft-proof. The under-carriage can be removed in minutes and when the office is securely anchored, will withstand 100 mph wind load and unlimited snow load. The unit may be purchased in two forms. One in a knock-down kit form and the other as a fully factory assembled, wired and painted model. For full details write Wheaton National Sales, 228 East Park Ave., Wheaton, Ill., or circle **No. 9-26.**

Laminated Panels for Highway Signs

The permanence of porcelain enamel finish, the lightness of aluminum and the strength of honeycomb core have been successfully combined in the California Metal Enameling Company's new A-10 laminated sign panels. Every sign is engineered so that windload requirements are "built-in." Even the largest signs required can withstand over a 100 mph windload with a deflection of less than 1/100 of the span. Cameo A-10 laminated porcelain enamel aluminum panels weigh only a pound and a half per square foot and are completely sealed against weather. These panels may be drilled or cut and the raw edges created by drilling will not rust because of the aluminum base. If replacements are needed for any reason, they will always match the color and finish of undamaged panels exactly because of the non-fading quality of the porcelain enamel. Write to California Metal Enameling Co., 6904 East Slauson, Los Angeles 22, Calif., or circle **No. 9-27.**

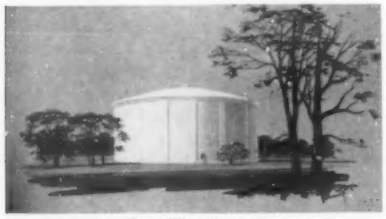
Laminated, porcelain enamel, aluminum panels weigh 1½ pounds per sq. ft.

Prestressed Concrete Tanks Show Big Savings

Maintenance Costs Cut By 75%

Over a 50 year service life, a prestressed concrete tank will show a 75% saving in total maintenance costs over a steel tank of the same capacity. In today's economy, such a long range saving has tremendous appeal to municipalities and water companies throughout the world. When your tank requirements are in the planning stage, these calculated maintenance costs should be considered. Average yearly maintenance on a 3,000,000 gallon steel tank is estimated at $2500 per year at current prices. For a prestressed concrete tank, maintenance is negligible; however, occasional painting for color effect may be desired.

When the charges for servicing the initial cost plus relative maintenance allowances are plotted, the prestressed



concrete tank will often show a lower out of pocket cost to the owner in less than 5 years. When these costs and their increases are extended for an expected service life of 50 years, the savings to the owner with prestressed concrete are enormous.

The prestressed concrete tank is also a good looking tank . . . it is inherently strong and extremely stable . . . it is designed and built for permanence.

And, 75% of the contract price is spent right in your local community . . . construction is done with materials and labor available locally.

Write today for more information on Preload Prestressed Concrete Tanks.

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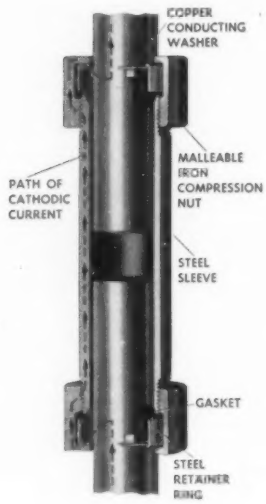
New York 16, New York

PRELOAD CONCRETE STRUCTURES, INC.
837 Old Country Rd., Westbury, L. I., N. Y.
PRELOAD MIDWEST CONSTRUCTION CO.
2211 East 19th Street, Kansas City, Mo.
HERRICK IRON WORKS
28400 Clawiter Road, Hayward, California
THE PRELOAD COMPANY, INC.
Jefferson Tower Bldg., 351 Jefferson, Dallas, Tex.
THE CANADA GUNITE COMPANY, LTD.
7325 Decarie Boulevard, Montreal 16, Canada

Electrically-Conductive Compression Couplings



Coupling will not heat up

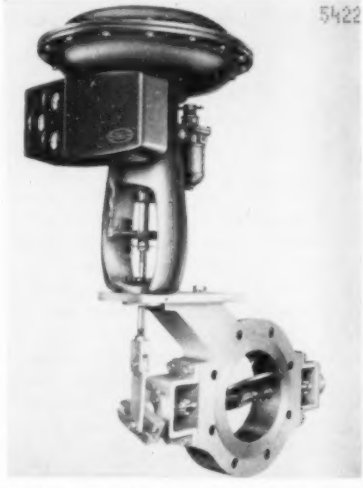
The Joslyn Type 212 electrically-conductive compression coupling has been specifically designed to provide a low-resistance electrical joint essential to cathodic protection systems. This coupling combines all the features of the standard compression coupling manufactured by the Joslyn Mfg. and Supply Co. and in addition assures a sealed-in bond when the compression nuts are tightened. Both the standard compression coupling and the electrically-conductive compression coupling are simple to install, are fully re-usable, permanently leak-proof, and economical. Their design eliminates thread cutting and close fitting of pipe, insures compression seal of gasket without friction or seizure, and produces high compression sealing force at the gasket surfaces. Both types of coupling are available in sizes from ½-in. to 2-in. IPS in a variety of metals and gasket materials. Write Joslyn Mfg. and Supply Co., Wm. E. Pratt Foundry Div., 155 No. Wacker Drive, Chicago, Ill., or circle **No. 9-28** on the reply card.

New Line of LPG Air-Cooled Engines

A complete line of LPG engines has been announced by Wisconsin Motor Corp. These engines have been specially designed for operation on liquefied petroleum fuels (Butane, Propane or a mixture of both). They offer the power user such benefits as cleaner operation, freedom from gum, lead and carbon deposits; complete fuel evaporation for maximum economy; greatly reduced percentage of carbon monoxide (of special value for in-plant operation); complete combustion of fuel in engine cylinders; and greater operating safety due to the use of a sealed fuel system. The 4-cycle engines include single cylinder, 2-cylinder and V-type 4-cylinder models in a complete power range from 2½ hp. to 55 hp. For complete information write Wisconsin Motor Corp., Milwaukee, Wisc., or circle **No. 9-29** on the reply card.

New Line of Butterfly Valves

Outstanding features of the new butterfly valve line are strong actuator mounting, ease of adjustment, accessibility and maximum actuator power delivery. A special actuator mounting plate has been designed which provides maximum support and makes it possible for the actuator to be adjusted along a slotted plate so that it may be precisely positioned to deliver maximum power with minimum angularity. This enables the connecting stem and link to be in line and at right angles to shaft arm at mid-stroke, for either 60° or 90° (or any intermediate point) operation. The 32,000 series butterfly valves come with either power, hand wheel or lever actuation. The hand wheel type is supplied with a closed gear box which includes an indicator; when used with power actuation declutching is provided. A wide range of sizes, from 2 to 24 ins. are now available, in materials of cast iron, cast alloys or flame cut carbon steel; ratings to 250 lb. ASA iron and 300 lb. ASA steel. Complete details from Mason-Neilan, Nahatan St., Norwood, Mass., or circle **No. 9-30.**



Valves come in a wide range of sizes

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Newly authorized position. Maximum age 45; Bachelor's Degree in Civil Engineering; 7 years engineering experience including supervisory and administrative responsibilities; must be registered as a Civil Engineer in the State of California. Salary range $821-$950 monthly; can be appointed at any step in the range. Apply by September 19, 1958 to:

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Thousands of progressive engineers are finding that our readers' service section is the easy, handy way to obtain new catalogs of advertised products. Be sure and return the postage free reply card opposite page 36.

SEE PAGES 36 to 56

Anti-Rust Paint

Paint has a penetrating vehicle which enables it to cut through the moisture

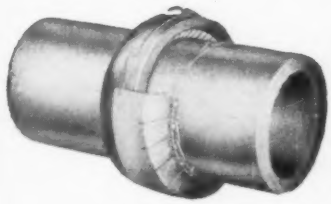
The development of Apex Black anti-rust paint that can be successfully applied over damp metal surfaces has been announced by Paramount Industrial Products. Laboratory and field tests have shown that it is not necessary to remove rust particles prior to Apex Black application. It is said it will resist dampness, grease, oil and mild industrial acids and will withstand extreme temperature changes. The paint can be used for all exterior and interior metal surfaces, old or new, including cross beams, pipes, towers and bridges. For additional information write Paramount Industrial Products Co., University Center Station, Cleveland 6, Ohio, or circle **No. 9-31** on the reply card.

• • •

Police Operation on the New York Thruway

The New York Thruway Detail of the New York State Division of State Police, staffed by 165 men at the end of 1957, intensified its enforcement of the traffic rules and regulations. The 169 vehicles and five motorcycles of the Detail traveled 7,050,305 miles during the year. The troopers investigated 3,576 complaints; reported 32,414 disabled vehicles, and made 31,187 arrests. Of these 30,586 involved traffic violations of which 22,638 were for charges of exceeding the speed limits. A total of 3,208 arrests on charges of speeding was made by using unidentified vehicles, compared to 19,139 arrests made by the regular cars. There were 5,811 arrests made by Radar Speedmeters.

BUILD BETTER SEWER LINES



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WESTON
GASKETS and FORMS
for
SEWER PIPE JOINTS
(a cement joint)

• No jute used—gasket centers spigot. • Definite space in each joint for cement. • Form confines cement-grout to lower portion of joint. • Particularly advantageous in water-bearing trenches. • Infiltration minimized.

L. A. WESTON CO.
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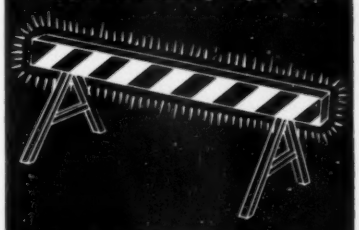
Safety FIRST, LAST and ALWAYS! with FLEX-O-LITE Type H Safety Spheres



Mark road hazards for eye-catching reflectivity and brilliance with Type H Safety Spheres at just pennies per square foot. Easy to apply with ordinary traffic paint. Fully effective — long lasting — economical. Write for details.

FLEX-O-LITE MFG. CORP.
8301 Flex-O-Lite Drive
P.O. Box 3066 (Affton Br.), St. Louis 23, Mo.

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Hugh Hollyday, *% Smith & Hollyday*
David W. Zander

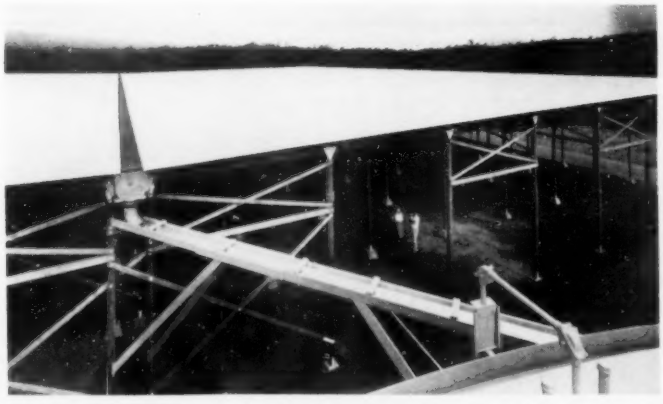
San Francisco 4, Calif., Russ Building
Bill Smith, *% Smith & Hollyday*

Kansas City 15, Mo., 4117 West 67th
C. H. Stockwell

100 to 1 scale model of the Fort Pitt Bridge being tested at Dartmouth College. Now being erected by American Bridge Div. of U. S. Steel Corp. across the Monongahela River at Pittsburgh, it is the world's only double deck bridge using box sections as arch ribs and with the tied arch using trusses instead of girders as ties. Total weight is 8,500 tons.

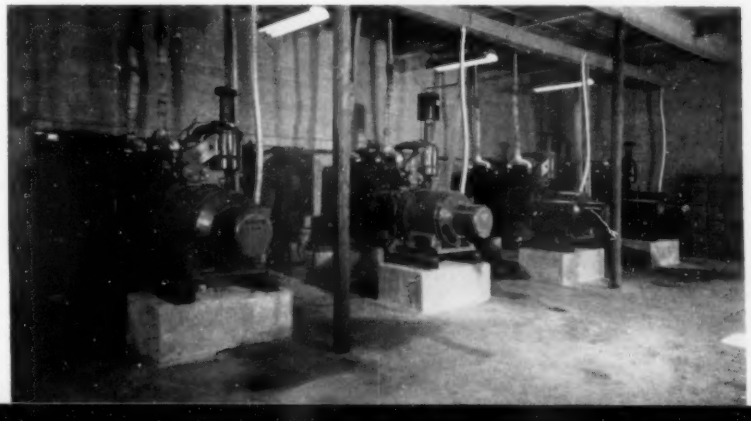
Final prestressing is shown underway on second of two 2,000,000-gallon tanks for the Public Service Board, City and County of El Paso, Tex. 104 ft. in diameter and 31.5 ft. high, they are scheduled for completion this month. Preload Co., Inc., designed the tanks and performed the prestressing. R. E. McKee is general contractor for the work.

—Worth Seeing



Over an acre of Kaiser Aluminum corrugated roofing sheet covers this water catchment shed in the Kilauea section, Hawaii National Park. The two sections, each measuring 100 by 200 feet, collect more than 27,000 gallons per inch of rainfall. Aluminum provides maintenance-free roof.

Man-sized five-foot length of Robinson Clay Product Co. pipe dwarfs 3-ft. section (center) and 2-ft. length made in 1877. Short sections in foreground were handmade about 125 years ago.



Never underestimate the power of a town! Beatty, Nevada, eastern gateway to Death Valley has only 650 pop., four motels and several restaurants and bars, but uses three of these International engines to supply electric power, with a fourth unit serving as emergency standby.

Atlas
JC-60®
STOPS
INFILTRATION

. . . reduces
pumping costs!

Infiltration of soil water into your sewage system greatly increases pumping and operation costs at the disposal plant. JC-60, a plastic-base sewer jointing compound, stops infiltration by adhering tenaciously to properly primed pipe.

This superior Atlas compound gives adhesion values of over 300 p.s.i. guaranteeing to you permanent bottle-tight joints. You are assured of lower pumping costs and long term service, with a minimum of costly repairs, when you specify JC-60.

Get the complete facts; write for Bulletin M20-3.

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

by Arthur K. Akers

★ INFILCO INC., Tucson, Ariz., elects W. M. Gross vice-president. He will continue to headquarter in New York. This gives Infilco officers on both Coasts, as Lawrence Cecil continues as vice-president, in Los Angeles.

Mr. Gross

Mr. Hoy

★ WALTER A. HOY is new advertising manager, Hercules Galion Products, Inc., Galion, Ohio.

★ THEODORE V. WOOD, vice president and general sales manager, R. D. Wood Co., Philadelphia, passed away July 2. A comparatively young man, he had been prominently identified with the valve, hydrant and cast iron pipe industries for many years.

★ R. H. HUBBARD, joins Standard Steel Corporation, Los Angeles and Decatur, as sales engineer. Portable asphalt plants are among their products in this field.

★ GENERAL ELECTRIC CO. announces removal of its two-way radio equipment department from Syracuse, N. Y. to its plant in Lynchburg, Va., formerly devoted to manufacture of rectifier equipment.

★ WARD W. CLARKE has joined F. B. Leopold Company, Zelienople, Pa., as manager of its Butterfly Valve Division.. Design, manufacture and field engineering will be his responsibilities.

★ EARTHWORM BORING MACHINES, Inc., is the new name for the former Lube Jack Co., Santa Monica, Calif. There will be no changes in personnel, but a stepped-up sales program.

★ OLLIE DeCELLE, Chicago, adds Herbert H. Ley to his staff for sanitary engineering equipment sales.

★ BLAW-KNOX CO., Construction Equipment Division, announces Austin K. Thomas became its general manager on July 1

★ C. "DOC" MEADER becomes district representative for Highway Equipment Co., Cedar Rapids, in eight Coast and Mountain states of the west.

★ CHARLES PARTHUM is new sales promotion manager, Bucyrus-Erie Co., South Milwaukee, Wis. He was formerly with Harnischfeger Corporation, Milwaukee, in a similar capacity.

★ HENRY F. MUNROE moves over from % Proportioneers, Inc. % to Builders-Providence Inc., another division of B-I-F Industries, Providence, R. I., as sanitary engineer.

★ ODIE E. WALKER (right) vice-president, Mueller Co., Decatur, Ill.

being sworn in as on loan WOC adviser to the director, Water and Sewerage Industry and Utilities Division, Business and Defense Services Administration, Washington, D. C.

★ PIPE LININGS, of Wilmington, Calif., keeps on expanding, including a new sales office in Fort Worth, with C. O. Davin in charge; and appointment of W. Dave Thomson to the sales staff at Wilmington.

★ NOTICE in doctor's office: Ladies in waiting room are asked not to exchange symptoms. It gets the doctor hopelessly mixed up.

—*Huber-Warco News.*

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W&T makes both volumetric (volume measurement) and gravimetric (weight measurement) feeders. There is a feeder for any size job, from small equipment to measure out ounces, to accurate giants capable of handling thousands of pounds per minute.

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